# STUDY OF AIRPOWER

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## HEARINGS

BEFORE THE

## SUBCOMMITTEE ON THE AIR FORCE

OF THE

## COMMITTEE ON ARMED SERVICES

## UNITED STATES SENATE

EIGHTY-FOURTH CONGRESS

SECOND SESSION

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AIRPOWER

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**PART VIII**

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S. Sgt. Maurice Lloyd Downard.

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# STUDY OF AIRPOWER

WEDNESDAY, MAY 16, 1956

UNITED STATES SENATE,
SUBCOMMITTEE ON THE AIR FORCE
OF THE COMMITTEE ON ARMED SERVICES,
*Washington, D. C.*

The subcommittee (consisting of Senators Symington, Jackson, Ervin, Saltonstall, and Duff), met, pursuant to notice, at 2 p. m. in room 212, Senate Office Building, Senator Stuart Symington (chairman of the subcommittee) presiding.

Present: Senators Symington, Jackson, Saltonstall, and Duff.

Also present: Fowler Hamilton, general counsel; Mamsay D. Potts, Jr., associate general counsel; Fred B. Rhodes, legal consultant to Senator Saltonstall; Edward C. Welsh, assistant to Senator Symington; and Wallace L. Engle, staff member.

Brig. Gen. Thomas C. Musgrave, Jr., Office, Secretary of the Air Force; Lt. Col. Donald S. Bussey, ODCSOPS, Department of the Army; Robert M. Pennoyer, Office of General Counsel, Office of Secretary of Defense; Mansfield T. Sprague, General Counsel, Department of Defense, and Capt. S. S. Searcy, Jr., USN., Office of Chief of Naval Operations.

**[The closed session testimony was censored by the Department of Defense for security reasons.**
**Those portions of the record affected by this censorship are indicated by the symbol Ⓓ.]**

Senator SYMINGTON. The meeting will come to order, please.

General Putt, we welcome you here with us this morning.

At this point in the record I wish to insert a summary of your outstanding background and experience.

LT. GEN. DONALD L. PUTT, USAF

Donald Leander Putt was born in Sugarcreek, Ohio, May 14, 1905. He was graduated from Carnegie Institute of Technology with a bachelor of science degree in electrical engineering in 1928.

That May General Putt was commissioned a second lieutenant in the Signal Reserve, and the following month he was appointed a flying cadet. After completing his flying training, on June 28, 1929, he was commissioned a second lieutenant in the Air Reserve. Three months later he received his regular commission as a second lieutenant and the following month was assigned to the 17th Pursuit Squadron at Selfridge Field, Mich. Entering the Air Corps Technical School at Chanute Field, Ill., in September 1930, he was graduated the following April and joined the 36th Pursuit Squadon at Selfridge Field.

Going to Wright Field, Ohio, in February 1933, General Putt served with the Flying Branch of the Materiel Division. Entering the Air Corps Engineering School in August 1936, he was graduated a year later, and the following year he received a master of science degree in aeronautical engineering from the California Institute of Technology. Returning to Wright Field in June 1938, he was

assigned to the Aircraft Project Group of the Materiel Division, transferring to the Production Engineering Section in October 1939. From December 1944 to July 1945 he was assigned with the United States Air Forces in Europe. In October 1945 he was named Assistant Chief of Staff for Intelligence at Air Materiel Command Headquarters, Wright Field, becoming Deputy Chief of the Engineering Division in December 1946.

Appointed Director of Reseach and Development in the Office of the Deputy Chief of Staff for Materiel at Air Force Headquarters, Washington, D. C., in September 1948, he became Assistant Deputy Chief of Staff for Development in April 1951. Three months later he was named Acting Deputy Chief of Staff for Development, reverting to his former position that Novemeber.

Transferred to Air Research and Development Command at Baltimore, Md., in January 1952, General Putt was vice commander, ARDC, and the following month he assumed additional duty as commanding general of the Wright Air Development Center, ARDC, at Wright-Patterson Air Force Base, Ohio (relieved of additional duty in June 1952). He assumed command of ARDC on June 30, 1953.

Returning to Air Force Headquarters in April 1954, General Putt was designated Deputy Chief of Staff for Development, and Military Director of the Scientific Advisory Board to the Chief of Staff, USAF.

His decorations include the Legion of Merit with 1 oak-leaf cluster, Bronze Star with 1 oak-leaf cluster, and the French Croix de Guerre with palm. He is rated a command pilot and technical observer.

On June 15, 1954, he was awarded an honorary doctor of engineering degree by Brooklyn Polytectnic Institute, New York.

He is a member of the Institute of Aeronautical Sciences; National Inventors Council; National Advisory Committee for Aeronautics; Society of Navy Architects; National Research Council; Scientific Advisory Board; and Marine Engineers; as well as Sigma Alpha Epsilon, Tau Beta Pi, Theta Tau, Eta Kappa Nu, Sigma Xi, and Scabbard and Blade.

General and Mrs. Putt have one son.

PROMOTIONS

He was promoted to first lieutenant April 22, 1935; to captain September 4, 1939; to major (temporary), March 21, 1941; to lieutenant colonel (temporary), January 5, 1942; to colonel (temporary), March 2, 1944; to major (permanent), September 4, 1946; to brigadier general (temporary), February 5, 1947; to colonel (permanent), April 2, 1948; to major general (temporary), September 14, 1949; to brigadier general (permanent), January 27, 1950; to lieutenant general (temporary), July 22, 1953; to major general (permanent), October 27, 1954.

Senator SYMINGTON. The practice of the committee is to have all witnesses sworn.

Is there going to be anybody else who will testify besides yourself?

General PUTT. These gentlemen will be assisting me in handling the papers here.

Senator SYMINGTON. You yourself will do all the testifying?

General PUTT. I will do all the testifying. Under the circumstances, could I occasionally ask them to answer for me?

Senator SYMINGTON. We had better swear them all.

Will you have everybody who might testify raise their right hand, please.

Do you gentlemen solemnly swear that the testimony you are about to give before this subcommittee of the Senate Armed Services Committee will be the truth, the whole truth, and nothing but the truth, so help you God?

General PUTT. I do.

Colonel JOHNSTON. I do.

Colonel REBER. I do.

Senator SYMINGTON. Have you a prepared statement, General?

General PUTT. Yes, sir; I have a rather short general statement.

Senator SYMINGTON. Have you got any extra copies of it?
General PUTT. There should be copies.
Senator SYMINGTON. Will you proceed?

**TESTIMONY OF LT. GEN. DONALD L. PUTT, DEPUTY CHIEF OF STAFF FOR DEVELOPMENT, HEADQUARTERS, UNITED STATES AIR FORCE, ACCOMPANIED BY COL. ROBERT L. JOHNSTON, DEPUTY DIRECTOR OF RESEARCH AND DEVELOPMENT, DCS/D, HEADQUARTERS, USAF; AND COL. CARL J. REBER, CHIEF, PROGRAM FUNDING DIVISION, ASSISTANT FOR DEVELOPMENT PROGRAMS, DCS/D, HEADQUARTERS, USAF**

General PUTT. Mr. Chairman, as the Deputy Chief of Staff for Development, it is my job to advise and act for the Chief of Staff, General Twining, in matters affecting the technical development of the Air Force.

I have overall air staff responsibility for the determination of requirements, the evaluation and development of new weapons systems and techniques, and the long-range planning incident to the initiation and development of new weapons and technology.

I am a member of the Policy Council of the Assistant Secretary for Research and Development, the National Research Council and the National Advisory Committee for Aeronautics.

I am also a member of the Air Force Scientific Advisory Board which was organized to advise the Chief of Staff of the United States Air Force on all matters pertaining to the impact of science and technology on air weapons.

In this position I specialize in the broad policy aspects and the overall administration of broad programs oriented on complete weapons systems. I am not, therefore, in a position to have specific and detailed familiarity with all of the individual projects that constitute our research and development program.

This is usually followed more closely by the commander of the Air Research and Development Command.

Senator SALTONSTALL. Of what command?

General PUTT. Air Research and Development Command with headquarters in Baltimore.

With this brief background of my primary responsibilities I should like to continue by pointing out that it is our research and development effort that determines the qualitative nature of our Air Force. Our research and development effort must be fitted into the broader picture of the status of science and technology in the United States and its relationship to national and international affairs.

I will sketch this picture briefly as I see it.

### SCIENTIFIC AND TECHNOLOGICAL REVOLUTION

I think all of us fully realize that we are living today in an era of vigorous scientific and technological revolution unprecedented in the history of mankind.

It is a revolution which I believe will have a far greater impact on our national economy than the industrial revolution of the 19th century or any other change we have undergone to date. It is an era

wherein our technological gains must become and remain one of our most important national products.

Dr. Lee Dubridge, president of the California Institute of Technology, and Chairman of the President's Science Advisory Committee, concisely emphasized this point when he stated that "science and technology are the foundation of our national prosperity."

Science and technology are rapidly moving ahead in all fields. they are expanding in geometrical ratio proportionate to the growth of our population, the consumption of electrical power and the utilization of other basic commodities.

In fact, they are expanding as our national gross product is expanding.

### RADICAL CHANGE IN WAR AND WEAPONS

Just as we are experiencing this scientific and technological revolution in industry, so we are experiencing a similar radical change in warfare and weaponry. An alliance, or marriage, has occurred between science and arms, between the scientists and the military. New weapons devised by science are bringing about significant changes in tactics and strategy. Conversely, changes in tactics and strategy required by changing world conditions generate demands for new weapons to meet new strategies. The interaction between science and strategy is continuous.

Most people associate the military only with wars, but some of the greatest advances of civilization have been spurred by military necessity. All through history, military projects have contributed to our growing standard of living. For example, the television industry within the United States owes a large measure of its current status to developments in electronics during World War II.

A new model now appearing on the market includes amongst its improvements the application of printed circuits which will greatly enhance the reliability of the set and will also reduce initial maintenance costs.

This is a rather simple example of direct application of know-how brought about by our guided-missiles program. Radar and electronic devices developed primarily for military use have been adopted by our commercial passenger and cargo carrying airlines. These have improved flight safety tremendously.

Developments in aerodynamics, structures, and propulsion brought about by military necessity have materially enhanced the capabilities of our commercial aircraft not only in their safety of operation but improved economy of operation as well. A direct outgrowth of our technology in gas turbine engines is nw appearing in our railroads and automobiles as well as our jet-powered transports.

Improvements in fuel and lubricants brought about by military necessity have allowed our automotive industry to easily double the horsepower of automobile engines using essentially smaller engines. Contributions in medical research have also been of great assistance to mankind in various direct and indirect ways.

### MILITARY EXPENDITURES SPEED SCIENTIFIC PROGRESS

I could go indefinitely on this subject if time permitted. There is little doubt that many of these improvements would have come about regardless of military expenditures.

However, the rate of progress would have been materially slower. Since our standard of living within the United States is the highest of any nation in the world, it is obvious that in order to retain this highest standard of living, our future existence in an economic sense depends almost entirely on improvements in technology.

### TIME DIMINISHES

The speed and altitude potential of modern air weapons, together with the tremendous destructive power of their nuclear payloads, makes the American Continent a potential battlefield for world war III. We can no longer fight a holding action while we muster our individual money to effect volume production of weapons of war.

The increasing complexity of weapons brought about by the inevitable progress in science and technology renders the development-production cycle for specific weapons such that we can no longer respond to spasmodic operations.

### COSTS INCREASE

As we have progressed from the relatively simple air weapons of World War I to today's supersonic, air atomic weapons systems, the cost for each new fighter or bomber has become greater for a given margin of superiority.

For example, the Convair B–58, a medium range bomber being developed, will cost much more than did the B–47. (D)

The North American F–100 fighter currently going into operational units is a much more costly and complex machine than the F–86 it is replacing.

The problem of weaponry research and development is further complicated and made expensive by the fact that at any point in time, work is being performed on at least four generations of weapons: First, model improvements of weapons in production and in inventory; second, scheduled development of the next weapon system to go into production; third, pursuit of those technical developments of new equipment and techniques which will form the building blocks for the next succeeding generation of weapon; and finally, basic or fundamental research to acquire new knowledge to push back the scientific frontiers, and remove the barriers to still more advanced and effective weapons.

Increased complexity of design in the first two of these four generations of weapons creates an additional problem area for research and development which we must account for and strive to solve.

### TIMELAGS

That is the timelag from design to production. As a case in point, for World War II fighter planes it took 230,000 man hours from design to first flight of prototype; for supersonic fighters, this time requirement has extended to 690,000 man hours.

Twelve years ago detail drawing preparation for a fighter-bomber required 100,000 man-hours; today, such preparation for a similar type requires a million hours.

Admittedly, these increases have resulted in superior performing craft; we have nearly tripled the speeds; we have increased the ceiling from 30,000 feet to 50,000 feet; and we have vastly extended the range. But we are fast approaching a time-lag span of diminishing returns, particularly in the light of reports that Russia is shortening her lead time in weaponry development.

### SOVIET OBJECTIVE OF TECHNOLOGICAL SUPERIORITY

The Soviet are realists—they have analyzed the sitution properly. They have determined that to achieve their goal of world domination they must achieve technological superiority over the United States. That is their objective.

They have stepped up their industrial production capacity at an alarming rate; they have funnelled their manpower into scientific and technical training programs so that their national output in this area exceeds ours twice over; and they have concentrated the development of their military power along a program which is in line with their avowed intention to dominate the world.

It is not my intention to tell you we must match Russian power plane for plane, weapon for weapon, and type for type, nor do I mean to imply that we should measure our efforts by those of the Soviets.

### UNITED STATES MUST IMPROVE RESEARCH AND DEVELOPMENT

No responsible Air Force spokesman will make such remarks. But in order for us to maintain the qualitative superiority we must have more than adequate counter weapon capabilities; interceptors and warning systems to counter Russian bombers and long-range missiles; and our own missiles and strategic force to break through the defense capabilities of the Soviets if retaliation becomes necessary.

The key to maintaining this structure is a progressive research and development effort, concentrated in a manner to take advantage of all scientific breakthroughs, planned on the basis of a strong deterrent force, and not subject to peaks of frenzied activity during crises and valleys of inactivity during quieter periods.

Because of the vast number of weapons complexes needed, because of the longer lead times required to develop these weapons, and because of the shorter decisive phases of any future wars, it is more clear than ever that maximum research and development effort should take place during peacetime to insure availability of the most advanced weapons at the beginning of any future hostilities.

### UNITED STATES FAILING TO KEEP PACE IN TRAINING

The Nation is becoming increasingly alarmed at our failure to keep pace with the Soviet on the training of scientific and technological manpower. The Soviet modus operandi is predicated upon the primary motivating factor of fear and punishment. Our free enterprise system on the other hand is predicated upon the principle of inducement by reward for merit.

INCENTIVES NEEDED

How better then could we induce young Americans of today to undertake scientific and technical education than by offering rewards for success commensurate with the effort and training involved?

The rewards I speak of are not dictated by economic considerations alone, but include the attainment of prestige as well. A broad and generous research and development program for the United States Air Force, backed by a national policy that this program not be subject to peaks and valleys of previous years, but rather responsive to the requirements of the advances in this technological age, would offer an incentive to young Americans to undertake this difficult career far beyond that which is currently offered.

UNITED STATES AIR FORCE LOSING TECHNOLOGICAL MARGIN

In summary, the Air Force has been able to maintain the technological lead. But this lead has become progressively more expensive and decreasingly strong in comparison to Soviet power. If we are to maintain the required deterrent force-in-being, we must keep this lead while we have it.

We cannot afford to lose it by lulling ourselves into the complacent belief that our remarkable free-enterprise industrial forces can work the miracles they have done in the past; if we are ever subjected to an air attack under such conditions, we won't have the chance to produce.

We are faced with a ruthless and determined aggressor foe, who appears at least from the evidence which is already at hand, to recognize the basic tenets of survival in the air age, and who appears to not worry about duplications in the development field, nor the disproportionate application of a scientific and technical manpower of his military might.

Conversely, it becomes increasingly apparent that his industrial capacity for competitive goods has been vastly enhanced by his efforts in the military weapons development field.

If we are to maintain the required qualitative deterrent Air Force in-being we must always stay ahead through the development of tomorrow's weapons yesterday. World War III is being fought on today's drawing boards and in scientific laboratories.

ANYTHING LESS THAN BEST AIR FORCE IS NATIONAL SUICIDE

We could lose the next showdown if proper emphasis is not being placed on tomorrow's weapons today; further, dollars spent for less than the best Air Force, as measured against requirements, is a total waste. In fact, it is a national suicide.

Senator SYMINGTON. Thank you, General Putt.

When anybody thinks about aviation research in the United States, they automatically think about you. In my opinion there is nobody in the Air Force or the Navy who knows more about the question of air research than General Putt.

Mr. Counsel, have you some questions you would like to ask the witness?

Mr. HAMILTON. Yes, sir, I have some.

EXPERIENCE

General Putt, how long have you been concerned with research and development problems in the Air Force?

General PUTT. My assignments have been directly and indirectly associated with Air Force research and development for 23 years.

Mr. HAMILTON. What is your present position, for the record?

General PUTT. My present position is that of Deputy Chief of Staff, Development.

Mr. HAMILTON. How long have you held that position?

General PUTT. I have had that position since April 1954.

Mr. HAMILTON. And prior to that time what was your position?

General PUTT. Prior to that I was commander of the Air Research and Development Command.

Mr. HAMILTON. And what is the function of that command?

General PUTT. The Air Research and Development Command is really the field organization, the operating command that actually carries out the research and development operations. It operates its own test and evaluation centers and laboratories and then supervises the Air Force's research and development program which is almost completely conducted by industry for us.

Mr. HAMILTON. How long did you hold that position?

General PUTT. I had that position for 9 months. I had been the vice commander prior to that.

Mr. HAMILTON. How long had you been vice commander?

General PUTT. That was a year and a half, I believe.

SCIENTIFIC KNOWLEDGE IMPORTED

Mr. HAMILTON. I would like, if I may, at the outset to ask you a few general questions by way of background. I wonder if you would care to comment, General, on the extent, if any, to which the United States has been dependent, say, upon research and development in Western Europe, looking back a period of half a century or 75 years.

General PUTT. It can certainly be said that prior to World War II, by far the large part of our fundamental and scientific knowledge really came from Western Europe. There is where you will find the largest number of Nobel prize winners; our really basic and fundamental discoveries came from there.

I think it has been traditional that the American with his Yankee ingenuity has concentrated more on the application of that knowledge, the industrial know-how to produce things in large quantities.

As long as the world was alined the way it was, that was a fortunate circumstance perhaps, and we relied considerably, to a major extent I judge, on the basic fundamental information that came from Western Europe.

Of course during World War II we used up a lot of that scientific information. You can think of it as a well. We were pumping out of it as we were increasing the research and development of our combat weapons systems, we were using it up.

We were bumping into the frontiers. We were lacking in knowledge, there were gaps in our knowledge. But during World War II, we pretty well knocked out Western Europe's capability to continue to produce this basic knowledge.

So we have been forced to concentrate more and more on planting the seed corn in order to reap the crop of weapons that we need to accomplish our military job.

Mr. HAMILTON. Having in mind the fact that the United States and the U. S. S. R. are the two preeminent powers in the world, and having in mind the importance that each of them is attaching to the development of new scientific weapons and weapons systems, what would be your opinion as to the extent to which in the future we could rely upon research and development in Western Europe in our own research and development system here with regard to scientific weapons systems?

### UNITED STATES MUST DO MORE BASIC RESEARCH

General PUTT. Well, certainly we can to the degree that Western Europe will engage in basic scientific research within the capabilities of their economy, and I would look for more now that Germany is getting back on its feet.

I think you could say that is the one largest concentrated source, not that the others do not contribute, but in volume the Germans have historically contributed more.

But I think it would be dangerous to place too much dependence on foreign sources. We want to take advantage of all we can get from there, but to place dependence for our own knowledge that we need to develop our own weapons systems——

Mr. HAMILTON. You think we should be dependent upon our own efforts?

General PUTT. We must be, I think.

Mr. HAMILTON. Would any of the Western Europeans be engaged, to anything like the extent that Russia and we are, in the development of scientific weapons systems, long-range bombers, missiles, and so forth?

General PUTT. Well, I am not an expert on European economy, but just from my own general knowledge I would say I do not see how for the foreseeable future they could engage in it to the extent that we are now.

Mr. HAMILTON. Turning now to the point to which you adverted in your prepared statement with respect to Russian progress in the field of research and development, how would you characterize the present situation, the present relationship between our own status of research in the research and development field with reference to airpower and that of the Russians, or compare them in any way you may care to, historically, in the present, in the future, or any other way.

### SOVIET'S PROGRESS RATE EXCEEDS UNITED STATES

General PUTT. Let me try to set a little bit of framework here so that I do not get too confusing. It is not an easy question to answer.

Mr. HAMILTON. No, it is a complicated question.

Just answer it in any way you care to.

General PUTT. If one will consider for the moment that the United States has been progressing in its military research and development at whatever pace you want to establish. Assume that we have been making just a straight line progression, and that each year we are

doing a little more, progressing and learning more and getting better and more effective weapons.

Obviously, in the past, we have been way ahead of the Russians. I do not think you have to go back much farther than World War II, the beginning or the end, it does not really make too much difference.

At that time you could almost discount what the Russians had been doing in comparison to ourselves. So now what we see is a start from what you might call practically zero on the part of the Russians in military research, development, technology, and the production of effective weapons, and we see a tremendous rate of progress being made since the end of World War II.

It is hard to measure an average overall picture, but attempting to strike an average of where they are, what we see are two curves, both of them generally sloping upward, but one——

Senator SYMINGTON. Off the record.

(Discussion off the record.)

Senator SYMINGTON. Back on the record, please.

General PUTT. So that we see two upward rising curves of different degrees of steepness, and at the present I would say that the gap between the two curves is closing quite rapidly.

As best I can judge, I would say that at the ends of those curves as of 1956, if it is significant to try to strike an average, that our average, I believe is still ahead of the Russians today.

But this is not what worries me mostly now. I would of course be real worried if I thought they were ahead of us as of today.

But as long as we have got a lead and there is a chance of keeping it, that is one thing. But to see that gap continually closing, the rate at which it is closing and the fact that unless the trend is changed, either we change ours or the Russians change theirs, some day they are going to be ahead.

And it is too late if we want to change the trend to do it tomorrow when the curves might intersect. We have got to do something about it today.

Senator SYMINGTON. I have not had the opportunity to talk to you for, I guess, several years. For clarification, what you mean is if we allow them to get ahead, we can never prevent them from being ahead.

General PUTT. No; I do not believe I do.

Senator SYMINGTON. Clear that up then, will you?

General PUTT. Yes. If they got ahead, then by great effort it is conceivable, of course, that we could steepen our curve to where the positions would be reversed to what they are today.

In other words, we would have a curve that was sloping upward faster than theirs, and then again we could intersect their curve and go ahead. It is a leapfrog operation, but it would take much greater effort at much greater expense to try to overtake them than it ever will be to keep up with them or to keep ahead of them.

### R. AND D. EXPENDITURES

Mr. HAMILTON. Turning now, General, to the research and development expenditures, do you have some figures that you could give the committee as to research and development expenditures in the Air Force going back some considerable period of time so that the committee can have the benefit of perspective?

General PUTT. Yes, sir; I do have appropriation figures here.

Mr. HAMILTON. I wonder if you would mind just reading them off?

General PUTT. These figures might not check exactly with an examination of all of the appropriations bills over the past year, but what we have attempted to do as best we could is to give these figures under comparable ground rules of accounting, because during the years there have been some shifts in accounting and how we keep track of expenditures so we have tried to make adjustments here to make our figures comparable.

Mr. HAMILTON. Did you take as your standard ground rules those now prevailing and then apply those to other years?

BOOKKEEPING CHANGE

General PUTT. We did it in the reverse, because the ground rules made a significant change 2 years ago in 1956.

We have adjusted the 1956 and 1957 figures to fit the ground rules of the past. In 1940 we had $12 million appropriated for research and development. That is even a higher figure than I remember it, Mr. Senator. I had remembered a figure of $8 million but I will have to defer to the record rather than my memory.

In 1941 we had $92 million. I think it is significant to note the variations up and down.

In 1942 we had $66 million; in 1943, 149, and in 1944 back to 136.

In 1945 up to 154. The end of the war came, there was some money available, and in 1946 we went up to 252 million, almost double. In 1947 the trend reversed, we had 110 million, less than half.

In 1948 we were up to 145. In 1949 further increased to 204. In 1950 a slight increase to 233. In 1951 it was increased to 297. Came Korea 1952 and we went to 425. In 1953 to 525.

Senator SYMINGTON. These are fiscal years or calendar years?

General PUTT. These are fiscal years.

In 1954 back to 440. In 1955 further back to 418. In 1956 comes an accounting change and I will describe that.

The figure in 1956 that is comparable to the 418 in 1955 is 431 million. Our appropriation would show 570 million because it shows indirect costs formerly funded from other appropriations.

Mr. HAMILTON. I will develop the various elements by questions when you conclude, General.

General PUTT. Good.

And in 1957, our present financial plan is 449 million on a basis comparable to figures already given. The appropriation request will show 610 million, but that includes 161 million of indirect costs which prior to fiscal year 1956 were funded in other appropriations.

Mr. HAMILTON. Do you regard the wide degrees of variation from year to year that those figures show as being a satisfactory method of funding research and development?

R. AND D. FUNDING UNSATISFACTORY

General PUTT. It is very unsatisfactory.

Mr. HAMILTON. And why is that, General?

General PUTT. Well, for this reason. I would like to use an example. That perhaps would be the best way to explain.

Usually a research and development project, will take about 4 years to complete, let's say on an average.

Sure we have some that will only take a year and we have some that will probably take 10, but for the illustration assume that the average development period of all of our projects was 4 years. This means that in any given year then you will have completed 25 percent of the projects.

This means that if you had the same amount of dollars and there had been no increase in costs or labor, materials, complexity had not added anything to costs with the same amount of money the following year you could initiate 25 percent dollar value of new projects .

So each year you could initiate one quarter of new projects. Now what happens if you have got 50 percent of your budget. Not only can you not initiate new projects but you have to cut out some that you have already started. This becomes a waste of money.

FLUCTUATING FUNDING WASTES MONEY

It is ineffective, it is timewasting, and it wastes dollars.

Senator SYMINGTON. You say this becomes a waste of money. What do you mean by "this."

General PUTT. That kind of funding.

Senator SYMINGTON. What kind?

General PUTT. A fluctuating funding where it is up and down, peaks and valleys.

Mr. HAMILTON. Now, General, I would like to ask you if you would describe the various elements that enter into research and development expenditures, broadly speaking, not limited to your particular appropriation.

ELEMENTS IN R. AND D. EXPENDITURES

General PUTT. In my prepared statement I mentioned these four phases that we are working on at any one period of time; so that in the development function there is first the basic research and fundamental investigations to just acquire knowledge. That is one category in which funds labeled "research and development," we call them the P–600 funds, that is a budget terminology, almost exclusively finances the research program.

Then we have what we call the technical development program. This takes the knowledge that we have acquired in the fundamental and basic research part of our program and attempts to apply it to something useful.

Mr. HAMILTON. Those two items—the scientific and the technical—are they included in these figures that you have given us?

General PUTT. They are.

Mr. HAMILTON. And do they constitute those figures?

General PUTT. Not completely. There is still an additional.

The next area then is taking the results of your fundamental knowledge and the results of your technical developments and putting these together into weapons systems and developing the complete system.

This would be the complete guided missile, the complete B–52, the complete B–58 or something of that nature.

Here R. and D. funds, labeled as such, are partly used to pursue the weapon development program.

This has varied over the years as to just when you stop using R. and D. funds and when you start using production funds, even though you are still in the development process.

In some cases the R. and D. funds might finance the development of the weapons system only through the mock-up. This is a full-scale model of what it is you are going to build.

Production funds might go on to it from there on out on the airframe. In other instances research and development funds have financed 1, 2, or 3 flying prototypes, and this has varied over the years, so to this extent the figures are still not exactly comparable but they are as near as we could get them.

Mr. HAMILTON. So that you might have procurement funds utilized——

General PUTT. That is right.

Mr. HAMILTON (continuing). For what is really still part of the research and development phase, so to speak.

General PUTT. Right. In other words, these figures are not the sum total of dollars that have contributed to the development function.

### PROCUREMENT FUNDS

Mr. HAMILTON. What do those figures include besides the scientific part and the technical part?

General PUTT. And part of the weapons systems.

Mr. HAMILTON. But in addition you get funds from procurement for development of weapons systems on occasion?

General PUTT. For instance, the procurement of service test items.

Senator SALTONSTALL. Service test what?

General PUTT. Service test quantities of new weapons. You may remember, Mr. Symington, we used to buy 13 service test models after we had built 3 experimental models. These usually came from production funds. The practice varies considerably, whether you are talking about an airframe, whether you are talking about an engine, whether you are talking about electronic components as to how these funding rules are applied. It is a real complicated accounting procedure to keep straight.

Now in addition, and I think this may be what you are searching for, dollars which are labeled "research and development," include our contract funds with which we contract with industry to do the research and development.

Mr. HAMILTON. What percentage roughly of your research and development is done under contract with industry would you say?

General PUTT. I can give you the answer.

Senator SYMINGTON. I would like to ask a question for clarification I thought perhaps the counsel was going to ask. Maybe he did and you answered it and I still do not understand it.

### BOOKKEEPING CHANGE, NOT ACTUAL INCREASE

You said at one point there was a major change in procedure with respect to research and development funds.

Mr. Counsel, I would like, before we get off that aspect——

Mr. HAMILTON. Would you describe that?

General PUTT. Yes. I think I can answer both your questions at once there, Mr. Secretary.

Senator SYMINGTON. Well, to show what I am getting at, you gave for 1956 a figure of $431 million; but the figure of the Department of Defense was $601 million.

General PUTT. That is right.

Senator SYMINGTON. Therefore there must be some change, because, for the earlier years the figures you presented were quite close to the figures presented by the Department of Defense; but in more recent years there has been a wide divergence between what you say was spent for research and development and what was listed in the budget report of the Department of Defense. Presumably that is what you meant.

General PUTT. That is correct.

Senator SYMINGTON. When you said what you did.

Now would you explain to the committee why?

General PUTT. Yes, sir; in 1956 at the request of the Congress, the Department of Defense was directed to include in its research and development appropriations accounting all of the indirect costs that were applicable to the research and development function.

Mr. HAMILTON. What items would that cover?

General PUTT. Well, this covers maintenance of our centers, mowing grass, firemen, guards. Many of our centers have tenants on them, such as an air defense squadron, the expenses incident to maintaining the air defense squadron as a tenant, the housekeeping for them is charged into this indirect research and development expenditure.

You have utilities, gasoline, and oil that are used by the aircraft; both the test aircraft and administrative aircraft that would be on the field.

Senator SYMINGTON. Are you saying that an air defense unit that was tenanted on a research and development situation was an expense that was included in the research and development budget figure presented in the budget?

General PUTT. To this extent: The operation of the air defense unit, the provision of its equipment and the fuel and oil for its operation would not be chargeable to R. and D., but we still have to support them with guards and support them with all the administrative facilities of the post.

Those are very difficult to sort out because they all use the same post exchange, the same warehouses, and things of that nature.

So these indirect expenses all go into the research and development budget.

Senator SYMINGTON. It would be a simple matter to sort it out on the basis of some standard; as example, against total payroll; and then a percentage allocated on the basis of each component payroll.

That is common business practice.

General PUTT. One could make an arbitrary division of the funds.

Senator SYMINGTON. A comment with respect to your aide. It is customary in all hearings that at any time an assistant wants to advise or you want to ask questions of any of your staff, please both feel free to do so.

That is common practice.

Mr. HAMILTON. General, from what budget category of funds have you obtained funds for this kind of activity prior to the budget accounting change that was made for fiscal year 1956?

General PUTT. Those indirect funds prior to 1956 were budgeted in the maintenance and operations account known as P–400 funds and nonstandard laboratory and test equipment was budgeted in the P–200 procurement appropriation.

Mr. HAMILTON. M. and O. funds?

General PUTT. M. and O. funds are the P–400 funds and the P–200 are procurement funds.

Mr. HAMILTON. Now I will return to the question I was asking you before Senator Symington asked his.

### R. AND D. BY CONTRACT WITH PRIVATE ORGANIZATIONS

Could you give the committee any estimate of what proportion of your research and development work, properly so-called, which is within the budget that you have talked about, is done by contract with private concerns.

General PUTT. Yes, sir.

Mr. HAMILTON. Including universities, laboratories, and so forth?

General PUTT. Right. If one takes out the indirect and the direct supporting costs to the R. and D. program—this now includes the things that we have just talked about——

Mr. HAMILTON. That is if one takes out the M. and O. type of funds?

General PUTT. Yes; and then takes out those funds that support the operation of our centers, which are test and evaluation centers—they are not doing research and development, they are determining specifications and they are testing the products of our contractors—if you take that out then as of last year only $7 million out of roughly $385 million worth of research and development was being done by our centers.

Mr. HAMILTON. Only $7 million was being done by contract?

General PUTT. No; $7 million was being done within Air Force Establishment that could be identified as the type of work that you would contract for.

Mr. HAMILTON. And the remainder of the $385 million?

General PUTT. Is all done by contract with industry.

Mr. HAMILTON. Then do you have an additional expenditure for research and development work that you have not mentioned in the way of funds?

General PUTT. All of our facilities come in the public works program.

Mr. HAMILTON. That is all of your public works facilities?

General PUTT. All of our public works facilities are in the public works program.

Mr. HAMILTON. And they appear in the general Air Force budget and not in these figures you have given?

General PUTT. Not in these figures here.

### MAJOR ITEMS IN R. AND D. FUNDING

Mr. HAMILTON. Then am I right in my impression that there are four principal sources or types of funds that contribute to the complete phase of research and development, funds for scientific work and funds for technical work?

General PUTT. Right.

Mr. HAMILTON. Which constitute the preponderant amount of the figures that you have mentioned?

General PUTT. I will have to qualify that a little bit. In the later years your statement is pretty accurate.

Mr. HAMILTON. By later, you mean what period of time?

General PUTT. Oh, from 1952 or 1953 on.

Mr. HAMILTON. 1952 or 1953?

General PUTT. Yes.

Mr. HAMILTON. Before that some of the money that you had mentioned was spent for the kind of activity that would now come from procurement funds?

General PUTT. That is right. The reason for this is that back in those early days from 1940 up through 1950 you see, most of those dollars were put into hardware, whereas now since the war we have had to concentrate on some of the basic and more fundamental things since we cannot depend upon foreign sources any more. So there has been a little difference in where the dollars have been spent over that period of years.

Mr. HAMILTON. So that since the period 1951–52 which you mentioned, sir, the four principal elements have been the scientific funds and the technical funds which constitute the preponderant amount of the funds you have mentioned.

Then you have funds from procurement, for test models and things of that kind?

General PUTT. That is right.

Mr. HAMILTON. And then the fourth would be funds that you had gotten from public works funds?

General PUTT. Right.

Mr. HAMILTON. For construction of facilities?

General PUTT. I would have to add some others to be sure we get all the pennies put together.

Senator SALTONSTALL. I will have to add to the four sources of funds that Mr. Hamilton has mentioned.

Within the Air Force the pay of the military personnel who are assigned to research and development activities comes out of budget project 500.

Mr. HAMILTON. Which is personnel?

General PUTT. Which is payment of military personnel.

Mr. HAMILTON. How long has that been the case?

General PUTT. That has always been the case.

Mr. HAMILTON. Does that amount to a significant item in terms of your total cost?

General PUTT. Do you remember what that is?

Colonel REBER. No, sir, I do not have the figures. It is about 20,000 airmen and 5,000 officers.

General PUTT. It is roughly 25,000 officers and enlisted personnel. We can provide the figure.

(The requested information is as follows:)

*Costs of military personnel directly engaged or in support of Air Force research and development*

| Fiscal years: | |
|---|---|
| 1953 actual | $92,571,240 |
| 1954 actual | 96,259,125 |
| 1955 actual | 100,846,000 |
| 1956 estimated | 103,789,000 |
| 1957 estimated | 106,234,000 |

Mr. HAMILTON. Turning now to the funds that you have discussed there, what were they for fiscal 1954, 1955, 1956, and 1957 again?

R. AND D. FUNDS SHOW LITTLE CHANGE

General PUTT. 1954 was 440, 1955 was 418, and again on this comparable basis, 1956 was 431 and 1957 was 449.

Mr. HAMILTON. Did the Department of Defense or the Office of the Secretary of Defense issue you any guide lines with respect to the amounts of these funds, General?

General PUTT. Yes, sir.

Mr. HAMILTON. Did you have guide lines for each of those years; do you recall?

GUIDELINES DETERMINE DOLLAR AMOUNTS

General PUTT. Yes, we had guidelines for each of those years.

Mr. HAMILTON. And in general, how does the guideline operate?

General PUTT. Generally just before budget time, budget preparation time, and for fiscal year 1958, that is right now, the Secretary of Defense, Assistant Secretary, Comptroller and Assistant Secretary of Research and Development——

Mr. HAMILTON. That is Assistant Secretary of Defense for Research and Development?

General PUTT. For research and development, yes, issue these guide lines which generally state a dollar figure. In year to year they have varied a little bit in addition to stating a dollar level. They have said, for instance, in addition to submitting a program for this amount of dollars, submit an additional list of either a percentage over or a certain number of dollars over of next lower priority projects that one would want to do.

These guide lines then are usually discussed in the Department of Defense research and development policy council, and after a considerable amount of discussion, they are issued as guide lines to the three departments and form the basis on which the program, the services' research and development program, will be planned.

Senator SALTONSTALL. Mr. Chairman or Mr. Hamilton, could not we put the guide lines into the record?

Mr. HAMILTON. Yes, I think that would be a good thing to do, Senator. We asked the Defense Department to supply us with guide lines and they supplied us with 3, guide lines for 3 of the 4 years. What I would like to do, if it is agreeable, when we get the other one for the fourth year, is to insert them in the record at this point.

Senator SALTONSTALL. Then there are different guide lines for the different years?

Mr. HAMILTON. That is my understanding that there is a different guide line issued each year.

General PUTT. Yes; each year.

Mr. HAMILTON. This is the kind of document it is, sir. That is 1956 and 1957. Maybe I should say that we only requested them yesterday.

(The guideline information requested appears later in this testimony.)

RESEARCH AND DEVELOPMENT DOLLARS STABLE AS COSTS RISE

Mr. HAMILTON. In the 4 years the expenditures have been roughly the same amount?

General PUTT. That is right.

Mr. HAMILTON. You mentioned in the course of your prepared statement that the research and development cost of developing a fighter plane or a bomber to replace the existing one has generally been increasing in cost, is that right?

General PUTT. That is correct.

Mr. HAMILTON. You gave us some figures yesterday which might be interesting in comparing the B–17 to the B–52 in that regard.

General PUTT. Yes.

Mr. HAMILTON. I wonder if you would mind stating those for the benefit of the committee?

General PUTT. The B–17, the first B–17 and in this case the first experimental B–17, was built by the Boeing Co. and on private speculation. It cost them complete $500,000, a half million, and of course at that time that was the world's best and almost only long-range heavy bomber, short-legged as it would look now, it was still our long-range bomber at that time.

The B–17 of course has been replaced by a succession of other, more advanced weapons systems, until today we are up to the B–52.

The B–52, the first experimental article, cost us in the neighborhood—we built two, so there is a little difficulty here in allocating the dollars to one, but roughly one could say the first B–52 now, which is after many replacements, serves the purpose that the B–17 did, cost us $50 million.

There is a terrific span of time in there, a time span, and there is also a terrific difference in the performance and the capabilities so that perhaps a more meaningful comparison would be the development costs of the F–51 which we went into World War II with, the F–86 which we entered Korea with, and the F–100 which is now going into the inventory.

Mr. HAMILTON. What are the figures for those three planes?

General PUTT. For those three planes—could I give you the man-hours?

Mr. HAMILTON. Yes; any way you want to that would be helpful.

General PUTT. It would give you a better feel for the problem. Just the wind tunnel and engineering hours on the F–51 were 2,077, on the F–86, 66,776, a factor of 33 times greater.

Mr. HAMILTON. And what is the difference between those two fighters, sir?

General PUTT. The time period—comparing the dates when they became operational there is about 7 years difference.

Mr. HAMILTON. Seven years?

General PUTT. Yes. However, between the F–51 and the F–86 is one generation, you see.

Mr. HAMILTON. Yes. But you had mentioned the time and I wanted to get the precise time for the record.

General PUTT. That is right. Then the F–100 took 168,000 man-hours.

Mr. HAMILTON. Do you have any basis for a judgment as to what the situation is likely to be in the future, whether they will level off, lessen, or the proportion will increase?

General PUTT. They certainly will not decrease.

There may be some leveling off.

In other words, the rate of increase, if you plotted these three, might not continue at such a steep upward trend.

Mr. HAMILTON. But you think that there will be some increase?

General PUTT. I think there will be some increase because they are getting more and more complex and require more and more man-hours to develop, man-hours or dollars.

Mr. HAMILTON. Has this situation existed with reference to the 4 years you mentioned, General?

General PUTT. Pardon?

Mr. HAMILTON. Has that situation which you just described existed with respect to the 4 budget years that you mentioned?

General PUTT. Yes, indeed, it has. The total engineering man-hours for the F–51 was 154,000, for the F–86——

Mr. HAMILTON. By total you mean to produce the first plane that flew?

General PUTT. That is right.

Mr. HAMILTON. 154,000?

General PUTT. 154,000.

Mr. HAMILTON. For the F–86 it was what?

General PUTT. 1,132,000, and for the F–100 it was 4,040,000.

Mr. HAMILTON. 4,040,000?

General PUTT. That is right.

Mr. HAMILTON. What was the difference in time between the F–86 and the F–100?

You have given us the difference of 7 years between the F–51 and the F–86.

General PUTT. Approximately 5 years.

Now the costs run like this, and I am sorry but these are just the airframe costs.

Mr. HAMILTON. Are these costs that you are talking about, are they the research and development costs that come out of the kind of a budget you have been reading?

Maybe I can get at the point in a different way.

Do you have the answer to that question?

General PUTT. In the first two, the F–51 and the F–86, we can say that research and development funds paid for the first of each of those two aircraft.

Mr. HAMILTON. I see.

General PUTT. In the case of the F–100, we would have to look that up, but I think you would find a rather small contribution of research and developments funds as such.

Mr. HAMILTON. The thing I was trying to get clear for the record was whether this increasing amount of cost, because of the increasing complexity of the planes, was borne, so to speak, proportionately by the research and development budget of the kind that you had been reading, or whether the increase in proportionate cost was borne by other items that contribute to the total phase of research and development, if you understand?

General PUTT. Yes. I think it is fair to say that because of the manner in which the research and development funds were held level, that other parts of the budget have borne a considerable part of the increasing costs.

Mr. HAMILTON. What I was trying to get at, has any of the increasing cost been borne by the research and development budget?

General PUTT. Oh, yes. It would be hard to sort out just what percentage.

Mr. HAMILTON. Yes; I appreciate that. I am just wondering what the facts are.

General PUTT. Yes, indeed.

Mr. HAMILTON. So that with the level budget, you found that an increasing amount of it was being taken through the years in research and development of the kind you talked about for the development of replacement weapons?

General PUTT. Absolutely; yes, indeed.

The airframe costs for the F–51 was $26,841. You see, this does not include the engine and the military equipment that went into it. The F–86 was $121,000 and the F–100 $486,000.

### SOVIET DEVELOPMENT

Mr. HAMILTON. Now turning to Russian development during the 4 years to which these budget figures relate, what would you say have been the principal developments by the Russians with respect to scientific weapons or scientific defense measures that you have had to take account of from the standpoint of your research and development work during that period—that is not really precisely phrased.

What I mean is not what their developments are, but what developments have you learned about during this period that have caused you to make research and development expenditures—the principal ones?

General PUTT. Well, certainly their rapid strides in building a long-range air force equipped with what looks like some pretty good equipment in terms of range and altitude, performance, their fighters, their development of some first-class radar equipment to use in their own air defense. To answer your question a little more directly, their progress in the development of fighters, of course, has had a direct result on the developments that we have had to do in radar, in new weapons, new missiles, to bolster our air defense.

### UNANTICIPATED REQUIREMENTS

Mr. HAMILTON. Now then, coming to the expenditures from research and development funds that have been made during this 4-year period, have there been any expenditures you have had to make that you did not, in a general way, foresee the necessity to make at the beginning of the period?

General PUTT. Qualitatively; yes. We are constantly, as science and technology moves on here, finding newer things that we are going to have to do to overcome the deficiencies of the equipment that we have in hand, to modernize it.

You have that factor plus the factor of what the competition is doing that together enter into the establishment of what you think the size of the research and development problem is, what is needed

to be done, and therefore how much money is required to do it when you cost it out.

Mr. HAMILTON. Now if I may just lead you to some questions, and if they give you an implication that is not correct, why you certainly tell me, General, in the interests of time.

Since we had this discussion yesterday it may save time if I ask some leading questions.

General Putt, in connection with the DEW and SAGE systems have you had to expend more money than you thought back in 1953, you would?

General PUTT. Yes.

Mr. HAMILTON. You can supply the details for the record if you care to.

(The information requested has been supplied in classified form.)

General PUTT. I think that might save the committee some time.

Senator SYMINGTON. As long as it has been brought up, was it considerably more money?

General PUTT. Well, it is considerably more money within the total Air Force budget, but looking at the figures here, I could not honestly say that it was a lot more out of the research and development appropriation.

Mr. HAMILTON. I think for clarification we should talk against the particular figures that we have and then when you supply them, show that you got funds for the total research and development from the other sources, if that is agreeable.

General PUTT. Yes; that is right.

Mr. HAMILTON. And what about long-range radar?

General PUTT. Long-range radar associated with all of the air defense aspects, not only the distant early warning line, DEW line, but associated with SAGE is one of our very critical areas and where we feel we are quite deficient now. We have attempted, for the last 3 or 4 years, to step up the work that we are doing in radar, not only in basic and fundamental work and new techniques, but larger powered equipment, equipment that will operate to higher altitudes than we now have the capability for doing, and at extended ranges.

Mr. HAMILTON. I want to be clear, General, when we are talking, that you have in mind what my question is, and that is to what extent you have had to expend more funds during the period than you thought at the beginning of the period you would have to do. You had planned, I assume, to do some work in this field?

General PUTT. Yes; but my difficulty in answering your question is sorting out just how much is attributable to what we have learned that the Russians are doing, and how much we would have done anyhow.

Mr. HAMILTON. Yes; I realize that is a problem.

Unless you think there is some significant additional burden, so to speak, on the budget because of Russian developments, why then I would assume your answer would be that you have not.

General PUTT. Well, I think definitely there has been an increase because of the Russian developments.

Mr. HAMILTON. That is in the radar field?

General PUTT. In the radar field.

Mr. HAMILTON. What about the missile field?

I am talking now not about the IRBM or the ICBM but air-to-air missiles or surface-to-surface missiles.

General PUTT. Indirectly as the development of those weapons contributes to their effectiveness, I am sure that the Russian developments have brought about an increase in our requirements and at least our desire to do more work in that field. (D)

Mr. HAMILTON. Have we discovered during this period that they were more advanced than we might have supposed they would have been in the electronics field generally?

General PUTT. From time to time we have been surprised.

Mr. HAMILTON. What about our expenditures from research and development funds for electronic countermeasures? Do they come within this category?

General PUTT. They mostly come within this category. They finance the type of development work where I think you will find a larger percentage of just plain research and development funds than you would find in engines and airframes, for instance.

Mr. HAMILTON. Turning now to the IRBM and the ICBM, do they come within this category?

LONG-RANGE BALLISTIC MISSILE RESEARCH EXPENDITURES

General PUTT. The ICBM and the IRBM are being financed mostly out of funds other than research and development funds. Just to give you an order of magnitude, in 1957 our financial plan now being prepared would call for the expenditure of $37.5 million out of R. and D. funds.

Mr. HAMILTON. What was it in 1956?

General PUTT. It was $20,600,000.

Mr. HAMILTON. Was this IRBM and ICBM?

General PUTT. No, just ICBM; $37.5 million now planned for 1957 and $20 million in 1956.

Senator SYMINGTON. What was it in 1955?

Genral PUTT. In 1955 it was $20,100,000.

There was no money in 1955 on the IRBM.

Mr. HAMILTON. I thought we were talkin about the ICBM, aren't we?

The figure you gave us for fiscal year 1956 was $20 million. I thought that was for ICBM; is that right?

Senator SYMINGTON. If it takes some computation, why not get the figures for the record at this point?

General PUTT. It is $20,100,000 on the ICBM for 1955.

Mr. HAMILTON. Then could you supply us please, General, for the record, with the figures on the ICBM and the IRBM for the years in question?

Senator SYMINGTON. For the last 5 years, including fiscal year 1957, is that all right, Mr. Counsel?

Mr. HAMILTON. Yes, sir.

(The information requested has been supplied in classified form.)

Senator DUFF. May I ask a question there?

Senator SYMINGTON. Please.

Senator DUFF. That is just out of your R. and D. funds?

General PUTT. Out of the R. and D. appropriations; yes.

Senator JACKSON. But that is the only source of funds for the Western Development Division?

General PUTT. To do research and development work defined as such.

Senator JACKSON. On the IRBM and ICBM?

General PUTT. That is correct; yes.

Western Development Division, of course, managed the funds from other sources that go into the development of the IRBM and ICBM, but to do what is purely research and development work within the law of what you can use the different funds for, this is all of the R. and D. funds that have gone into——

Senator SALTONSTALL. Mr. Chairman, I don't want to interrupt, but may I ask a question?

Senator SYMINGTON. Yes, indeed.

Senator SALTONSTALL. General, it is awfully difficult, as you and I know, to follow these figures.

General PUTT. It is.

CONFUSION RE BUDGET FIGURES

Senator SALTONSTALL. Now, this morning in an open session, the Department of Defense, if these figures are right, and I think they are because I took them down, said out of a total research and development program including the procurement that you have been talking about and so on, of $5,200 million this year—that is in all the 3 services—$2,646 million are going into guided- and ballistic-missiles development.

And I specifically ask if that includes the intercontinental and the intermediate and the others?

Senator SYMINGTON. If the Senator will yield, I think that the nature of Mr. Hamilton's question, while the Senator was out of the room, would explain the discrepancy he is referring to.

Senator SALTONSTALL. I hesitated to ask that question at this time.

M. HAMILTON. I think it is good to have that clear on the record, though.

Senator DUFF. Yes, because you get a completely wrong impression.

Mr. HAMILTON. You don't want to give the impression this is all the money being spent for the IRBM.

Senator JACKSON. I think that is what we ought to have, a breakdown on the money that comes from R. and D. in the Air Force for the ICBM and IRBM.

Then you have the IRBM No. 2 which is the Army-Navy project, which is another source. But you are only responsible for the ICBM and the IRBM in the Western Development Division, General Schreiver?

General PUTT. That is correct.

Mr. HAMILTON. You ought to have the other items that go into those two missiles.

General PUTT. That is right.

Senator DUFF. Mr. Chairman, the purpose in my asking that question, we can develop that idea that there were a lot of other funds, and you would have to have the whole picture in order to know what we are doing in all phases of it.

Mr. HAMILTON. I was trying to lay a background for that in the earlier question.

Senator JACKSON. My suggestion would be if there is no objection, and I think it would answer your point, too, Senator Duff, which is a good one, that the listing be made of the funds that come out of research and development in the Air Force, and then the Air Force supply the additional items that make up the grand total for the IRBM and the ICBM.

Senator DUFF. That is the point I was making.

Senator SYMINGTON. Without objection, that is the way it will be done. I suggest, General Musgrave, that the figure Senator Saltonstall gives us now as the figure the Department of Defense presented in the open hearing this morning be broken down in the Department of Defense; in order that in the record at this point we can show all the component cost parts, service by service, and department by department in the service in question. The total would be the figure just given by Senator Saltonstall of some $2,600 million.

(The information requested has been supplied in classified form.)

KILLIAN REPORT

Mr. HAMILTON. Turning now to the Killian report, General, are familiar with that?

General PUTT. Yes, sir.

Mr. HAMILTON. Would you describe in a general way what you understand that report to be insofar as it relates to the Air Force?

General PUTT. Right. The President asked his science advisory committee to assemble a group of eminent scientists in the United States to appraise the technological capabilities of the United States on the basis of its offensive and its defensive capabilities to resist aggression or some type of war.

The Killian report then was the report of this group of scientists. It was a very thoroughgoing report. They did a lot of investigations and studies on their own. They interrogated all of the departments as to their research and development programs in the fields in which they were interested, and issued their report to the President.

This was passed to the Department of Defense and then each of the three departments sorted out what part of the Killian report was applicable to each of the three departments.

Mr. HAMILTON. Do you recall the year in which it was issued?

General PUTT. The Killian report came out in calendar year 1955. It was dated February 14, 1955. This report was studied thoroughly by the Air Force as to what impact it had on the Air Force's research and development program.

It was not exclusively a research and development report. They went into things other than research and development, but it had its impact on research and development.

It recommended considerably more effort than was being placed by the Air Force in parts of its program at that time.

I don't think that the Killian report actually recommended the initiation of programs that we already did not have some work going on, and to that extent it looked like we had pretty well anticipated all the things that were needed.

RECOMMENDATION EXCEEDED MONEY AVAILABILITY

But there was a considerable discrepancy between the effort that they thought should be going into various programs and what we were able to put into those programs within our dollar ceilings.

Mr. HAMILTON. What did you do, if anything, after you received the Killian report, with respect to your expenditures?

General PUTT. The first thing we did was try to compile what it was we were doing and how much money we were putting on to the program at that time, and then attempted to cost out the additional dollars that would be required to emphasize the program as they had recommended.

We then attempted, by various and sundry means, to obtain more funds to place the emphasis where they had recommended that it be done.

Senator SYMINGTON. What do you mean by "various and sundry means"?

General PUTT. Well, you have several avenues of approach. The Secretary of Defense usually has an emergency fund to take care of things that come up during the year that you have not planned on or have not programed for.

You can make a request on those funds.

The Secretary of Defense this last year had authority to transfer, I think it was, up to $50 million from other funds available to the Department of Defense into research and development, so this was another source.

There was also the possibility, of course, of just taking the money that we had and reprograming it and changing the emphasis within our own program.

Actually I think we approached all three of those.

Mr. HAMILTON. Did you get additional funds, General?

General PUTT. The accounting gets a little sticky but I will try to give it as best we can.

Senator SYMINGTON. Can you answer the question first and then develop it?

General PUTT. Yes.

Senator SYMINGTON. The question was, did you get additional funds?

General PUTT. We did get additional funds.

SUFFICIENT FUNDS NOT AVAILABLE

Mr. HAMILTON. Did you get enough additional funds to fund your requirements?

General PUTT. No, sir; we did not.

Senator SYMINGTON. I am just trying to follow you.

General PUTT. Right.

Senator SYMINGTON. And I would like to know what you asked for, and what you got, based on the Killian report, to keep the chronology of the testimony straight.

General PUTT. Let me give you some round figures, because I happen to remember them and we can refine them.

Senator SYMINGTON. Give them round and, if you think necessary, correct them for the record.

General PUTT. We asked for approximately $129 million. This would have been for 1956. The 1957 figure, had we gotten the 1956 funds and then carried on that program so generated into 1957, amounted to $222 million. We actually received $3 million out of the emergency fund, and we got $19½ million transferred from other Air Force appropriations.

I feel reasonably sure, and I might as well explain it here, that the records of the Department of Defense—did you have an opportunity to check?

Mr. PENNOYER. No; I did not.

General PUTT. The records of the Department of Defense will show that other additional funds were made availablet to the Air Force to do some of the Killian items.

I would like to explain that.

When the dollars for research and development were appropriated in 1956, they were not all apportioned to the Air Force. There was some held in reserve at the Department of Defense level.

Senator SYMINGTON. Will you repeat that please?

General PUTT. When the funds as appropriated were then apportioned——

Mr. HAMILTON. Appropriated by the Air Force?

FUNDS HELD BY DEPARTMENT OF DEFENSE

General PUTT. Appropriated to the Department of Defense for the Air Force—were then apportioned to the Department of the Air Force by the Bureau of the Budget. There were some funds recommended by the Department of Defense to be held in the Bureau of the Budget.

Senator SYMINGTON. By the instructions of the Bureau of the Budget?

General PUTT. I think this is Department of Defense practice. I do not know where the instructions come from.

Senator SYMINGTON. Do you know how much the figure is?

General PUTT. It was 30 million in the case of the Air Force.

Senator SYMINGTON. For clarification, an amount of money was appropriated for research and development by the Congress to the Department of Defense for the Air Force, is that correct?

General PUTT. That is right.

Senator SYMINGTON. And of that money, $30 million was held in the Bureau of the Budget at the recommendation of the Department of Defense; was withheld from the Air Force?

General PUTT. That is right.

Senator SYMINGTON. What fiscal year are we talking about?

General PUTT. 1956.

Senator SYMINGTON. Fiscal year 1956.

General PUTT. 1956, current year.

Senator SYMINGTON. You asked for 120 million?

General PUTT. Right.

Senator SYMINGTON. And you received 3 million. But you did not receive that from that 30 million. You received it from the special fund in the Department of Defense?

General PUTT. That is right.

Mr. HAMILTON. Are you talking about 30 or 40 millon?

Senator SYMINGTON. Let me follow the figures.

General PUTT. You are on the right track.

Senator SYMINGTON. Now let's go back over that again, to be sure we get it right.

You asked for $129 million for the fiscal year 1956.

General PUTT. Right.

Senator SYMINGTON. Which if you had received it would have required $222 million plus for the program in 1957. But after you asked for that, you received three separate types and characters of amounts. The first was $3 millon you got from a special fund in the Department of Defense?

General PUTT. Right.

Seantor SYMINGTON. The second was $17 million that you got as a result of transferring accounts in the Department of the Air Force?

General PUTT. Nineteen and a half.

Senator SYMINGTON. $19.5 million?

General PUTT. That is correct.

Senator SYMINGTON. That was not the figure you gave first—$19.5 million.

General PUTT. $19.5 million.

Senator SYMINGTON. And the third figure you do not know, which was money that was given by the Department of Defense to the Air Force.

Now my question is, did the amount of money you asked Mr. Pennoyer about come from the Department of Defense? Would that have come out of the $30 million withheld? Do you know that?

General PUTT. It did come.

Senator SYMINGTON. It did come out of that 30 million?

General PUTT. That is correct.

Senator SYMINGTON. Will you supply for the record how much came out of the $30 million.

General PUTT. Right.

Senator SYMINGTON. So you have 30 plus 19.5 plus 3, or 52.5 million, as a result of your request for 129. Is that correct?

General PUTT. Correct.

Senator SYMINGTON. Did you get any more money than 52.5?

General PUTT. Not for the Killian items.

Senator SYMINGTON. Thank you, Mr. Counsel.

Mr. HAMILTON. Now as to that 30 million, I wonder am I right in the impression I have, General, that that was the money that had originally been appropraited for research and development projects in the year?

General PUTT. That is the way I understand it.

Mr. HAMILTON. And it was being held in the Department of Defense at the time you made your request for funds?

General PUTT. Right.

Mr. HAMILTON. Then that was released by the Department of Defense to the Air Force for research and development to meet these Killian report requirements?

General PUTT. To meet the Killian report requirements, right.

FUNDS FOR KILLIAN REPORT ITEMS

Mr. HAMILTON. Now what had been the status of your program with respect to those funds prior to the time they were released for Killian report items?

General PUTT. We had projects programed against that $30 million that was held in the Department of Defense so that when we got that 30 million to put on the Killian items, the programs against which we had intended to use the 30 million were not funded.

Mr. HAMILTON. What were those programs, do you recall?

General PUTT. I don't recall. We would have to go back. We will supply that.

(The information requested has been supplied in classified form.)

Senator SYMINGTON. Senator Saltonstall, the counsel and I have been questioning the witness now for over an hour and a half. I think the questions have been very constructive. They show counsel has taken great care to plan out his questioning as a result of previous interrogation of the witness. It has been a long time since other members of the committee have asked questions. Would you like to ask questions now or would you prefer to have the counsel continue his interrogation?

Senator SALTONSTALL. I follow the rules, Mr. Chairman, which is to have the counsel finish. I think that is the most constructive way to do it. I simply say this: That I think we are going to have to stop fairly soon for rollcall.

Senator JACKSON. We are going to vote at 4.

Mr. HAMILTON. I have come to a point if you gentlemen would like, while this is fresh in your minds, to ask questions, I don't think it would destroy what continuity I can contribute.

Senator DUFF. I suggest that he continue and finish his interrogation.

Senator SALTONSTALL. I think we will have to quit probably within a half hour.

Senator SYMINGTON. We can come back after rollcall.

Senator JACKSON. We will be tied up. This is the first amendment. There are going to be several of them.

(Discussion off the record.)

Senator SYMINGTON. Suppose we continue to the first vote, letting the counsel go ahead with his questioning; is that all right, Jim?

Senator DUFF. That is fine, I think.

Senator SYMINGTON. All right.

Mr. HAMILTON. All right, sir.

ARNOLD ENGINEERING DEVELOPMENT CENTER

Now, General, turning to the Arnold Engineering Development Center, I wonder if you would describe briefly to the committee what that is.

General PUTT. Yes; indeed. The Arnold Engineering Development Center is a group of facilities located in Tennessee that was conceived back in 1945 and 1946 following the end of the war when it was quite apparent from some of the things that we had seen and learned that the Germans had done and were doing at the end of the war indicated that there was much that we had to do to expand our facilities to be able to develop the new weapons that were going to come along.

WIND TUNNEL

It is essentially a large testing facility with several large high speed wind tunnels that operate in the order of 3½ to 4 times the speed of sound, and then there are a couple of others that operate up to the speed of 10 times the speed of sound.

These are very large facilities. I think it is interesting to note that some of the earliest and basic equipment that went into operation down there, was captured enemy equipment, which gives you some feel for how far the Germans had advanced in this field, and this equipment was good enough to be fitted into the installation that we still have under construction in Tennessee.

Some of the facilities have gone into operation. I think this illustrates the characteristic long lead time that research and development facilities have. The facilities themselves, that is the technical facilities, not the brick and mortar that encloses them or holds them up, but just the technical facilities themselves, require a great amount of development, just like the development of the weapons that you use the facilities to develop.

So there is not only the lead time for the development and the design of the facilities, but then the actual construction and placing in operation.

These facilities were of such a nature and so much larger and of greater capacity performance than anything we had ever built before, that we had to make models, working models, in order to develop some of the design criteria.

In one case the model is of such size that we are using it as a useful research and development tool, to get useful data.

It was not just a model that we built and threw away, but we are now using it as a research tool.

I think this is rather dramatic as one of the problems of facilities in general as they are handled under the public works program, it just takes a lot of time.

Senator SALTONSTALL. General, will you repeat what the model is?

General PUTT. It is a wind tunnel, model of a wind tunnel. We have a brochure here if anybody is interested enough to look at it.

Senator SALTONSTALL. I recall that very well.

General PUTT. It is a rather dramatic illustration of the problem the research and development program has with facilities. They are of long lead time, as I have explained, and they are of such long lead time that it is awfully difficult in the justification to point specifically to a piece of hardware that you are going to have to test 10 years down the road or 6 years down the road, which represents pretty much the lead time on facilities.

Hence, the best justification that one can normally give to such long lead-time facilities is, well, we just know that we are going to want to build bigger engines some day or we are going to want to build faster airplanes, and if we are going to do that we are going to have to have facilities that will have the capabilities of testing at these higher thrusts and higher speeds.

Now very dramatically, I think, to illustrate the point, the supersonic leg of one of the large facilities will come into operation in 1959.

The first item that will be tested in this latter facility will be the warhead and reentry body for the ICBM. Ⓓ

Mr. HAMILTON. When was construction of that structure started approximately? I am referring now to the particular structure in which you are going to test your ICBM element.

General PUTT. Just within the last year.

Senator SYMINGTON. May I ask a technical question just for clarification?

How are you going to test ballistic reentry for the ICBM at the high speeds anticipated?

General PUTT. We cannot test reentry under required conditions in any existing wind tunnels. Ⓓ

PROGRESS HAMPERED BY LACK OF FACILITIES

Mr. HAMILTON. If you had one now, could you utilize it?

General PUTT. We certainly could; and it would make our problem much, much easier.

Mr. HAMILTON. When you say it would make your problem much, much easier, what do you mean, General?

General PUTT. From what we know now theoretically and what has been proven experimentally goes up to say in the order of a Mach number 5—there have been some tests run more than that, up to 10, in real small throats, but when we get up to Mach No. 20 this is a terrific extrapolation of present knowledge. Ⓓ

Senator SYMINGTON. That is what I was getting at.

General PUTT. Yes; a terrific extrapolation of what we know. We will have to use the testing techniques available. Ⓓ

Mr. HAMILTON. If you had that facility in being now could you utilize it?

General PUTT. Oh, absolutely.

Mr. HAMILTON. If you had it earlier could you have utilized it?

General PUTT. Yes.

Mr. HAMILTON. Would that have accelerated the development of your ICBM if you had that facility?

General PUTT. It would.

Mr. HAMILTON. Is there any way you can estimate the extent to which that would have accelerated the development of the ICBM timewise?

General PUTT. Well, to put a time factor on it is a little bit hard to do, but I think it is correct to say that lack of knowledge in this hypersonic field was one of the critical points, the places where we did not have information, and from that standpoint you can say that it has slowed us up.

Now if we had had such a facility, we would have been accumulating knowledge in the hypersonic field.

Whether it would have been applied to the ICBM would, of course, have been dependent upon where the urgency was at the time.

Mr. HAMILTON. Have you had in the past any interest in getting such a facility?

General PUTT. Yes, indeed.

Mr. HAMILTON. When did your interest start?

General PUTT. Well, our interest actually started back in 1946 when we started thinking about high-speed problems.

Mr. HAMILTON. Have you ever requested funds to build this kind of facility before, or earlier?

General PUTT. I would want to go back and check the record, but I would be surprised if in the original plan for AEDC, there had not been a request for facilities of greater capability than were finally approved and are now under construction.

Senator SYMINGTON. Isn't it true that part of the concept of the Air Engineering Development Center was a result of the astounding developments found in Nazi Germany when we broke into that country?

General PUTT. Correct.

RESPONSIBILITY FOR AMOUNT OF FUNDS

Senator JACKSON. I would like to have that information if they could. I would like to have a history of the requests they made to the Bureau of the Budget for funds or to the Secretary of the Air Force for the supersonic tunnel that would deal with Mach 10, Mach 20, and so on.

Senator SYMINGTON. Starting back as far as 1946?

General PUTT. Right.

Senator JACKSON. The whole history.

General PUTT. Yes. I do have in my documents here the critical points in the history of the AEDC legislative and appropriations actions.

Senator SYMINGTON. General, you see the implication of what Senator Jackson has asked.

General PUTT. That is right.

Senator SYMINGTON. Please have somebody on your staff make up a history of what we are talking about and submit it for the record.

Senator JACKSON. I want to find out who turned it down.

Senator SALTONSTALL. General, if you are going to get everything for the record, I think you know that this Arnold works down there was held up through differences of opinions as to whether the contractor was the proper man, and so forth, and so on.

Senator SYMINGTON. That is not correct. I don't think so, Senator.

Senator SALTONSTALL. The chairman knows considerably more about that.

(The information requested has been supplied in classified form.)

(Discussion off the record.)

Senator SYMINGTON. Let's go back on the record, Mr. Reporter.

Senator SALTONSTALL. Mr. Chairman, while the counsel has been interrupted, may I ask this question of the general?

Mr. HAMILTON. Certainly.

Senator SALTONSTALL. Have we the knowledge today to construct the tunnel that will give these tremendous speeds that they are talking about?

In other words, assume there were funds, have we the knowledge to construct such a tunnel?

I am asking that for information; I don't know.

I mean I have no knowledge. I would be surprised if we had.

General PUTT. I would say that we did not have the complete knowledge to just sit down and go ahead with the design. There would have to be some development and some experimental work done

to make reasonably sure that once we started committing it to heavy steel and hardware that it would operate successfully.

So I would not say that we had complete knowledge.

However, there have been some—well, you can almost call them unique or trick methods devised recently, and I believe we have one of these operating now, where we are getting from 18 to 20 Mach. number in very small sizes and for very short periods of time.

Senator SALTONSTALL. It is my memory that we have constantly been improving these tunnels.

We have been building new ones.

General PUTT. Correct.

Senator SALTONSTALL. Because the old ones could not be reconstructed to get the additional speeds?

General PUTT. That is correct.

Senator SALTONSTALL. And I have no knowledge of what is the ultimate speed that we can put through a constructed wind tunnel today.

Could you give me that information, approximately?

COULD DO THE JOB

General PUTT. Well, with today's knowledge I would think we would have a fair chance, if we wanted to build one that would operate at Mach No. 20 today, we could get on with the problem.

Senator SALTONSTALL. It is a question of knowing the stresses and strains and so on that would be required.

General PUTT. Yes.

Senator SALTONSTALL. Rather than how to put the thing through it at that speed?

General PUTT. That is right.

I am sure that there would probably be some good technical scientific people whose judgment might say: "Well, we should not start one today, but I think if we really set our minds to it we could do it."

Senator SALTONSTALL. Thank you, Mr. Counsel. (D)

INCREASED EMPHASIS ON MISSILE SPEED

Senator SYMINGTON. When was the hydrogen bomb exploded? I believe the Russians exploded theirs in August 1953. I don't remember when we exploded ours. About the same time; wasn't it?

General PUTT. Just shortly before that, on November 1, 1952.

Senator SYMINGTON. This nuclear development has resulted in the concentration of much greater bang in a much smaller package, so to speak, and in turn has caused us to think and plan in terms of a great increase in missile speed. Is that correct? (D)

General PUTT. That is a fair statement.

Mr. HAMILTON. Mr. Chairman, I observe it is 3 minutes of 4.

Senator SYMINGTON. We will wait for the bell. Go ahead until we are called.

Do you have some more questions?

Mr. HAMILTON. Yes, I have.

Have requirements for facilities at the Arnold Center——

Senator SYMINGTON. Can I ask you just one more question along the lines of that thinking?

IMPORTANCE OF PURE RESEARCH

Here is a case where, regardless of reasons, a clear-cut breakthrough results in our planning and new engineering center suddenly becoming completely obsolescent as against the work to be done. Would that be a fair statement?

General PUTT. I worry about the word "completely."

Senator SYMINGTON. All right. What I am trying to do is stress the importance of what a breakthrough does, even in development and research engineering?

General PUTT. It drastically upsets your plans.

Senator SYMINGTON. I am not being contentious, just trying to develop the facts.

General PUTT. I understand.

Senator SYMINGTON. To show what suddenly happened almost overnight?

General PUTT. That is right.

Senator SYMINGTON. A new unit planned as being way ahead is suddenly found well behind in development requirements.

General PUTT. That is right. We should always be flexible enough and capable enough to capitalize on such breakthroughs.

Senator SYMINGTON. Doesn't this again mean that research, pure research per se, is vital to the future designers of modern war products?

General PUTT. It is mandatory.

REQUIREMENTS AGAINST PUBLIC WORKS FUNDS

Mr. HAMILTON. General, in that connection, as a consequence of this need for testing objects moving at much higher speeds which you referred to, did you suddenly find yourself facing the requirement for additional funds from the particular category of R. and D. funds as to which you have given us figures with respect to the Arnold Center, or were you able to get the resources from other funds?

General PUTT. No; we were not, and there have been additional requirements stated for construction at AEDC to expand the capabilities of facilities that are already in operation, and during the construction phases, there are things that one can do in the change of the design or the addition of certain capacities, cooling capacities, exhausting capacities that could increase the capabilities of even those that are under construction and not yet in operation.

Mr. HAMILTON. I want to have the record be clear as to whether that requirement was a requirement against the kind of funds you have been speaking about, or whether it was a requirement against Public Works funds.

General PUTT. This was a requirement against Public Works funds.

Mr. HAMILTON. And was it or was it not an additional requirement against the kinds of funds of which you have been speaking, to any extent?

General PUTT. Not in this time period. It would have been when the construction was completed and the facility was put into operation, then the cost of operation does come out of the research and development fund.

Mr. HAMILTON. But during the time period that you have been talking about?

General PUTT. It would not.

Mr. HAMILTON. The requirement was for more construction funds?

General PUTT. This is correct.

Mr. HAMILTON. And those funds as I understand it come out of the Public Works category of the budget so called?

General PUTT. That is right.

### BASIC INGREDIENTS FOR R. AND D.

Mr. HAMILTON. I think it might be interesting for the committee, General, if you would describe as you did to us yesterday the four types of resources that go to make up research and development, if you have those in mind?

General PUTT. Yes. To conduct any research and development program, one needs four basic ingredients. You can think of others, but first one needs the dollars to do the things to be done.

Then one needs facilities, one needs people and then organization and management.

Now dollars respond quickly or could respond quickly. There is not really a lead time on funds. Funds are appropriated annually so at least there is no more than a 1-year lead time involved there.

If Congress is very good, at times you can even come back for supplementals, so dollars might be termed a short lead time ingredient of the research and development program.

Organization and management is a short lead-time thing because you can quickly establish something like the Western Development Division to take on a special job.

Your regular organization ought to be pretty flexible so you don't always have to set up something special to carry out a job.

But facilities, as I explained before, and it applies not only to things of the magnitude of AEDC but almost all of our facilities, is a long lead-time operation. In the case of people, quite apart from just going out and hiring off the labor market, and I am not thinking of that, we have the overall problem of raising the technological and scientific capacity of the people in the United States.

Senator SYMINGTON. Would you say skilled people, just to follow your thought?

General PUTT. O. K.; skilled people. This is a long term, long lead-time project if you are going to try to raise the skilled level of the people that are available to do research and development either in industry or in Government.

So we have got 2 short time, short lead-time ingredients and 2 long-time ingredients.

Now you cannot get along without some of each of those. But the thing that really sets the pace today in how fast you can move forward in your research and development—I am not sure that it would apply to all branches of science or all areas of weaponry, and I think it would, but certainly within aeronautical research and development and the allied sciences, and technologies that go with it to develop weapons systems—the facilities are the pace setter.

Of course if you have got all the facilities in the world and nobody to operate them, people that do not understand them, you won't get anywhere either, but if you have the dollars and the people and the management and organization, the speed at which you will progress

is determined by the facilities, the tools that you have to do the job with.

Mr. HAMILTON. From what funds do those facilities mainly come?

General PUTT. Mostly all our big facilities that are Government centralized facilities like our own research centers mainly come out of public-works funds.

Now some of the technical equipment that is installed in these large public-works facilities come out of some of the research and development funds.

Occasionally there are research and development facilities that are built mostly at contractors' plants which come out of procurement funds, what we call our P–131 funds.

They are specifically labeled for industrial facilities. So there is some support of research and development facilities at contractors' plants out of P–131 funds.

There have been a few exceptions made where contractors were going to utilize facilities that were on Air Force property or at Air Force establishments, and some few P–131 funds have been used there.

But by and large the great majority of the facilities funds come out of the public-works program.

Mr. HAMILTON. By and large the greater proportion of it comes out of the public-works program?

General PUTT. That is right.

Mr. HAMILTON. Turning for the moment, General, to your earlier testimony with respect to these figures that you have given us. As I recall it, and you correct me if I am wrong, the two principal items that constitute those figures you divided into two categories, one scientific and the other technical?

General PUTT. Technical.

Mr. HAMILTON. Scientific and technical, is that right?

General PUTT. That is a good term. We called it research and technical development.

Mr. HAMILTON. Research and technical.

### RESEARCH AND TECHNICAL ACTIVITIES

I wonder if you could describe in a general way the difference between the kinds of activities that are financed by the funds you classify under research, and the kinds of activities that are financed by the funds you classify under technical?

General PUTT. Yes.

Under research, research in itself is generally rather inexpensive as compared to when you start building an experimental missile or an experimental airplane.

And generally the research is the type of thing that is carried on in a college or a university or a nonprofit organization where most of the effort is with test tubes and some relatively inexpensive equipment.

A lot of it is theoretical studies where just paper and pencil and slide rules are used.

Generally it is in the basic physical sciences fields like chemistry, metallurgy, physics, mathematics, and things of that nature.

The end products are usually reports. They are information. It is not hardware or anything of that nature. It is just reports.

You acquire new knowledge. You better understand the laws of nature and why a certain thing happens.

Now in the technical-development program, this becomes more expensive than research; that is one reason why you ought to have a real broad base of research, because you can cover a lot of territory and it does not take a lot of dollars comparatively speaking.

It is still a lot of dollars but comparatively when you are spending for hardware it is something different.

In the technical development field, you attempt to take this knowledge that is derived from your research efforts, and try to apply it to something useful.

For instance, you have learned something new about the way a radar tube would work, so now you try to build the tube and see if this new theory that you have discovered will actually operate.

In other words, you try to confirm your theoretical studies which you conducted in research. We take all kinds, take the new tubes and the new transistors which came out of basic research, and things of that nature.

Now you try to put those together to, say, make a new bombsight, a radar bombsight. You are still not worried about what kind of an airplane or airframe or missile this is going to go into. You are just trying to prove out some techniques, see if you can make this new knowledge do some better work for you than it ever did before.

You try to develop the building blocks, as we call them, the black boxes that will perform the military functions when it comes time to commit yourselves to building a new weapons system, a new airplane, a new B–52, a B–58, or something like that.

Then when you start wrapping some tin around these black boxes, you have got the components as we call them, or the sub system, bombing and navigation, the fire control, the electronic countermeasures, the defensive armament, the engine, and propellers, if it has propellers.

What you would like to do is be able to pull these latest things off the shelf, you see, and now put them together, integrate them into a complete weapons system.

Mr. HAMILTON. In view of your familiarity with our own research program and your familiarity with intelligence on the Russian situation, will you give the committee an appraisal of our present position vis-a-vis that of the Russians with respect to jet engines? How you would say we stood vis-a-vis them from the scientific aspect?

### SOVIET PROGRESS IN JET ENGINES

General PUTT. Could I qualify or disqualify myself?

Mr. HAMILTON. Certainly. If there is any field this interrogation takes you into that you feel diffidence about answering, don't hesitate to say so.

General PUTT. I would just like to qualify my capabilities in speaking specifically of the Russian intelligence.

Mr. HAMILTON. Yes.

General PUTT. In my capacity, where I am looking at broad policy and whatnot, I do not spend too much time on the specific performance of a Russian jet engine. I look at these reports and what I try to do is to just get a qualitative feel of where we stand.

Mr. HAMILTON. Their state of the art, so to speak, vis-a-vis ours in a very general way.

General PUTT. That is right, so in specifics I could be way off, but in general I think I have got a fair feel, at least I should have, of where they stand.

Mr. HAMILTON. All right, sir, take jet engines.

General PUTT. In jet engines the Russians have come forward real rapidly. They started out after the war with some Nenes they bought from the British.

Mr. HAMILTON. How do you spell that, sir?

General PUTT (spelling). N-e-n-e-s—Rolls-Royce British engines. The British were having considerable difficulties with the Nene engine in trying to keep some of the compressor blades in, and when we finally were able to examine one of the Russian-built Nene engines during Korea, it was found that the metallurgy that went into the Russian Nene engine was equally as good as what had been in the original British engines and, further they had found or had employed a very simple technique in metallurgy to correct this defect in the original Nene engine.

I think this even surprised the British a little bit when they saw that.

Senator SYMINGTON. Could I interrupt?

General Vandenberg told me when he sent in a helicopter, and came out with the first Mig engines, they found the Communists had worked out in production what neither the British nor ourselves had yet worked out in the laboratories. Is that right?

General PUTT. That is correct.

Here was a case where they were starting with technology that had been produced by somebody else and to a degree they were copying and adding to, but they have now demonstrated that they have a native capability of starting from scratch, so that some of the engines that we have seen demonstrate a considerable capability, or know-how in solving some very difficult problems.

The Russians I am told have always been good in metallurgy, particularly in the basic fundamental field. For years they have been good in this field, so it would appear that what was lacking in their capabilities of actually building or producing an engine was the application engineering and the industrial know-how to produce.

### SOVIET RATE OF PROGRESS

Mr. HAMILTON. How would you appraise the state of their art as comparable to our own in the jet engine field?

General PUTT. Well, I would say that if one can draw an average across the board, which may or may not be significant, but it is a measure, I still think that we are ahead of them, but at least to me this gives small comfort.

Mr. HAMILTON. Why is that, sir?

General PUTT. Because of the rate with which they are demonstrating a capability to do some pretty difficult and complicated things.

SOVIET ENGINES HAVE GREATER THRUST

Senator SYMINGTON. What is the thrust in a B–52 engine? Is it 11,500, roughly?

General PUTT. It is running around 10,500 pounds.

Senator SYMINGTON. And what is the thrust in the medium-sized bomber they apparently converted, the transport plane they dropped into London the other day?

What was the thrust in that engine?

General PUTT. On that one, our guess is 19,000 pounds.

Senator SYMINGTON. Now isn't it true in general that progress in jet engines is based to a considerable extent on ability to get thrust?

General PUTT. Total thrust, yes. That is really what determines how fast you are going to go.

There are, however, several ways of achieving total thrust.

Senator SYMINGTON. Take the J series. As you go on up from say J–57, what you are really doing is getting more and more thrust. Isn't that right?

General PUTT. Out of each particular unit, right.

Senator SYMINGTON. You say our best bomber has a thrust of around 10,500 and the Communists have a passenger plane with a thrust of around 19,000 pounds. Unless you bring in thrust per pound of weight, doesn't that show that they are way ahead of us?

I am asking for information. Life magazine had their new transport, their thrust as against our bomber thrust.

General PUTT. Right. I would like to put it in perspective. As you know from your experience in the Air Force, we are always trying to build a bigger engine.

We had under development a GE engine that would have been a large engine in the time that it would have been completed had we continued it and proceeded with its development at a reasonable rate. However, it took us too long to develop it so that the state of the art got ahead of it.

Senator SALTONSTALL. What got ahead?

General PUTT. The state of the art. Technology got ahead of it, that is the development of this specific engine proceeded so slowly.

Senator SALTONSTALL. It became antiquated?

General PUTT. It became antiquated before it was completed, that is right.

Mr. HAMILTON. Why was that, General?

SHORTAGE OF FUNDS LIMITS UNITED STATES ENGINE DEVELOPMENT

General PUTT. Well, we did not have enough money to do everything that we wanted to do, so we canceled this project as it became obsolescent, it did not appear to be——

Senator SYMINGTON. Would you say the reason, the Communists have a type and character of thrust nearly double ours is because of a limitation of funds in research and development in the Air Force?

General PUTT. If one assumes that had we had more money our judgment would have been the same and we would have thought that a big engine was desirable.

Senator SYMINGTON. We are not the ones to assume. On the basis of what you said before, I wish you would pinpoint your answer.

General PUTT. I think had we had enough money to carry it on, we would have developed bigger engines sooner than we have.

Senator SYMINGTON. And therefore we would not have been as far behind the Russians as we are today in thrust?

General PUTT. In individual units.

Could I——

Mr. HAMILTON. Certainly you may amplify your answer.

Senator SALTONSTALL. I want something said, Mr. Chairman, about weight, too.

Senator SYMINGTON. I brought in weight. I said per pound before in my question.

Senator SALTONSTALL. See if you can swing that into it.

General PUTT. The real criterion of the excellence of an engine, of course, in addition to the total thrust that it produces, is the thrust per pound of weight and its specific fuel consumption. I am not sure that we are as far behind as just the fact that they have an engine almost twice as big as ours would seem to indicate, and as has been explained in the press, for this reason.

In order to get an optimum design of an aircraft, there is some relationship between the total size of that airplane and the size of any one package of thrust.

Now other things being equal, the system designer has greater flexibility, if his propulsive thrust is not wrapped up in too big a package so that in this case we can still put the same total amount of thrust into an aircraft but with perhaps some greater flexibility of design, and another thing that would encourage us to go to 4 engines for a long-range airplane of this nature rather than 2 engines is the safety factor.

Senator SYMINGTON. Let me ask a question there. We have the B–47. How many engines has that plane?

General PUTT. Well, it has got six.

Senator SYMINGTON. And they have a plane called the Badger which has about the same wing spread and appears to be about the same type airplane?

How many engines has their Badger?

General PUTT. It has two.

Senator SYMINGTON. The Soviet medium bomber has 2 engines and our medium bomber has 6?

General PUTT. That is right.

### SOVIET ENGINE TECHNOLOGY ADVANCED

Senator SYMINGTON. Which they are enabled to do because of the amount of thrust that they have?

General PUTT. In the time period now of the Badger we also have engines of a size that we could power the B–47 with 4, or with 2, if this appeared to be desirable.

Senator SYMINGTON. How many such engines have you built?

General PUTT. Not very many. It is going into production. (D)

I am not discounting the fact that the Russians do have a bigger engine, an engine with more thrust. I am concerned about this because it demonstrates that they have the knowhow to overcome some very complex and difficult problems.

This concerns me more than just the fact that they have got a bigger engine than we have.

Senator SYMINGTON. I undertsand that, but the theory of the development of jet engines to the best of my knowledge is the improvement in thrust per pound of weight.

General PUTT. Yes.

Senator SYMINGTON. And it appears that they have done a better job than we, based on what we read in the newspapers.

Senator DUFF. Mr. Chairman, just to develop your thought there——

Senator SYMINGTON. Will you do me a favor?

General PUTT. Surely. (D)

UNITED STATES PROTOTYPES VERSUS SOVIET VOLUME PRODUCTION

Senator SYMINGTON. Don't follow the prevalent custom of talking United States prototypes against Communist mass production. I don't think it fair to compare an engine that you have built only a few of with an engine we now know they have built many hundreds of. (D)

COMPARISON OF ENGINES

Senator Duff has a question he would like to ask.

Senator DUFF. General, will you explain that thrust per unit that you were indicating as a distinction here awhile ago?

General PUTT. If one had an engine that weighed 5,000 pounds and produced 5,000 pounds of thrust, then you would say that it was 1 pound per pound of thrust.

Now if you had another engine that produced the same 5,000 pounds of thrust but only weighed 2,500 pounds, then you would be getting 2 pounds of thrust per pound of weight.

That engine is a much better engine than the one that weighed twice as much but produced the same thrust.

Senator SALTONSTALL. And how about fuel consumption?

Doesn't that enter because it is a question of the weight of your plane?

General PUTT. That is right; and the airplane or the engine that burns the smallest number of gallons of fuel per pound of thrust is a better engine than one that burns more fuel. It is just like your car. If you get 20 miles to the gallon that is pretty good but you would like to have 35.

Senator DUFF. Do we have engines that have more thrust per pound than they do?

General PUTT. More thrust per pound; about the most accurate I could be is they are in the same order of specific weight as our own.

Mr. HAMILTON. I believe Senator Duff's question was thrust per pound comparison, was it not, Senator?

Senator DUFF. That is right.

General PUTT. That is the specific weight, yes.

Mr. HAMILTON. I was not clear as to what your answer was.

General PUTT. They appear to have engines in about the same weight and specific weight range as our own engines.

Mr. HAMILTON. In other words, we are up to them?

General PUTT. Yes.

Mr. HAMILTON. We have an engine as good as theirs?

Senator DUFF. The only difference is that when they have a heavier engine, then they get that greater thrust, is that it?

General PUTT. The engine is heavier; yes.

It is a heavy engine, that is, it weighs a lot of pounds, although it is pounds per thrust.

Senator DUFF. And does that make the conclusion that it probably burns more fuel?

General PUTT. Not necessarily, no. The fuel consumption is rather independent of the weight of the engine. It has more to do with the aerodynamic design of the components in the engine.

Senator SALTONSTALL. The size of the hole?

General PUTT. The size of the hole; that is right.

Senator DUFF. Thank you; that ends my questioning.

General PUTT. Colonel Johnston has called my attention to an error I made in giving the example of the 2 engines—I said 5,000 pounds of thrust, and it weighs 5,000 pounds—would have a specific weight of 1, that is 1 pound of trust per pound of weight. Then my other example was intended to be another engine that had 5,000 pounds of thrust but only weighed 2,500 pounds, then it would have 2 pounds of thrust per 1 pound of weight.

Senator DUFF. I understand that.

Mr. HAMILTON. General, I wonder if you could supply for the record the period of time in which you lacked the funds to develop the General Electric engine, whatever that was.

(The information requested has been supplied in classified form.)

### SOVIET PROGRESS IN JET ENGINES

Senator SYMINGTON. I want to ask a package question here.

Do you believe that we are ahead in the jet engine field net, or do you believe that the Communists are ahead in the jet engine field net?

General PUTT. I feel we are ahead today.

Senator SYMINGTON. In the jet engine field?

General PUTT. Right.

Senator SYMINGTON. And do you feel that that gap is closing, the gap of our superiority?

General PUTT. Yes, I do.

Senator SYMINGTON. When do you think they will pass us in the jet engine field if things continue to go as they are going now?

General PUTT. I think it is very difficult on the basis of the knowledge that we get and the times that we have been surprised by not having seen any evidence of development work going on and then all of a sudden seeing a finished product, so that I do not believe I would be able to put a number of years on it.

I would say that I would not be surprised, if present trends continued, that somewhere in the decade they could do it.

Senator SYMINGTON. When you say in the decade what do you mean by that?

General PUTT. The next 10 years. However, I could be wrong by a 100 percent either way. This is just something that is very difficult to put a number on. There have to be a lot of assumptions made, one

of which would be that the Russians choose to put their effort into that work.

Senator SALTONSTALL. And also, Mr. Chairman, a breakthrough. I mean they might be working on this thing and break through. That would put them 10 years ahead?

General PUTT. In my judgment they have achieved enough scientific, technical, and industrial capability to achieve and face us with technological surprise.

Senator SYMINGTON. You have testified that their medium bomber has 2 engines and our has 6. We know our long-range intercontinental bomber has 8 engines and theirs has 4. We know that they have a jet engine which the minimum figure heard for thrust is 18,500 and the maximum is 21,500. We know the B–52 thrust is 10,500, our latest production bomber.

You say that over a period, as I interpret your testimony, you have consistently been given less money than you thought was necessary in order to develop your engine picture, along with other developments; yet you feel that we are ahead of them and you do not want to set a date when, even though you say the curves are closing, they will be ahead of us. Is that right?

General PUTT. That is right.

Senator SYMINGTON. That is your position?

General PUTT. Because there are so many imponderables, but you have pointed out some specifics of where——

Senator SYMINGTON. We would appreciate it if you would think about this; and when you come back tomorrow, give us your best estimate, if things continue along the same trend, when you think the Communists will pass us in engine development.

Senator DUFF. May I ask a question in that connection?

Senator SYMINGTON. Please, sir.

### RESEARCH BY PRIVATE ORGANIZATIONS

Senator DUFF. I was wondering, General, in addition to the funds for research and development that the Government expends of its own, in its own setup, plus what it contracts out, are any of the big outfits in America on their own making research on the same line for a continuous development of this sort of thing?

General PUTT. Yes; a considerable number of our contractors, our private firms, do support research and development out of their own company funds that either directly or indirectly supports weapons development and certainly contributes to the overall knowledge that is needed to progress with our development work.

Senator DUFF. What prompted me to ask you that question was I saw an article some time ago by the General Electric Co., I believe it was, that indicated that they felt on account of this long-range program of development that the President has spoken about, about the necessity of our keeping prepared over a period of 40 years, that it was necessary for them to make allowances and appropriations by reason of the great amount of work that they would get from the Government to inform themselves independently of any funds that the Government might expend for those purposes.

Is that in line with your idea about the thinking?

General PUTT. Yes. As a matter of fact the Air Force itself has been encouraging industry to use more of its corporate funds to aid in the development of weapons.

Senator DUFF. That is what I wanted to ask, Mr. Chairman.

Senator SALTONSTALL. Mr. Chairman, since it is open, may I ask this?

General, Mr. Newberry this morning testified that private industry was researching to the extent of $2,500 million, of which he estimated 10 percent was of value to our Armed Forces; in other words, that would be $250 million of independent research each year by private industry.

Of course, that would not all be confined to jet engines or anything else, but as a scientist and a research specialist, General, would you think that those figures were reasonably accurate?

I mean that is carrying out what has just been asked you?

General PUTT. Not having made a study of that, I would not know. I have seen so many different figures, and depending upon what ground rules one uses, you can come up with different sized figures, so I don't believe I could comment on whether those were good figures or not.

Senator SALTONSTALL. It interested me in view of what Senator Duff asked.

General PUTT. Yes. I was surprised at the 10 percent, but I guess if you consider all the research and development that goes into the making of washing machines, for instance, and things like that, that an appliance company would have to do, why maybe the 10 percent might be a reasonable figure.

I would have guessed offhand it was a little bit higher.

Senator DUFF. General, if I may make an ex parte remark here about the operations of this distinguished body to which we belong, we were supposed to be up there at 4 and now it is 20 minutes of 5, so we always have leisure.

### THRUST OF JET ENGINES

Senator SYMINGTON. What was the thrust on the J–47 engine?

General PUTT. Mr. Chairman, in addition to having a poor memory for figures, I don't trust my memory so if you will pardon me for all these referrals——

Senator SYMINGTON. What is the first jet engine on which you have figures there?

General PUTT. We have got them all right here.

Senator SYMINGTON. Let's just take a few. What was the thrust on the J–47?

General PUTT. The J–47–GE–25 engine has 5,670 pounds thrust. That is the military dry-thrust rating.

Senator SYMINGTON. 5,670. What plane was that in?

General PUTT. This went into the B–47E.

Senator SYMINGTON. And we improved the B–47 with the J–57, right?

General PUTT. The J–47 is still in the B–47.

Senator SYMINGTON. And the thrust is what?

General PUTT. 5,000 pounds.

Senator SYMINGTON. 5,000 pounds?

General PUTT. Right.

Senator SYMINGTON. What is the thrust of the J–57?

General PUTT. The J–57 is 10,000 pounds.

Senator SYMINGTON. And what is the thrust of the J–75?

General PUTT. The J–75?

Senator SYMINGTON. We understand you have some prototype models of that.

General PUTT. That is correct. (D)

Senator SYMINGTON. Those figures are not the same as the informaton furnished us. Where did we get this information? (D)

Mr. ENGLE. Performance charts of the Department of the Air Force.

General PUTT. There is no reason why those should not be correct.

Senator SYMINGTON. If the figure is wrong you correct it for the record. What is the thrust on the Serov transport again. You say 19,000?

General PUTT. Yes, sir.

Senator SYMINGTON. So we go to 5,000 to 10,000, and then perhaps higher, on what we have not yet gotten into production, as compared with their 19,000 on the transport which the Soviets showed. (D)

WEIGHT OF JET ENGINES

How much do the six engines weigh, in your opinion, on the B–47? You could get the weight on one and multiply it by 6. (D)

Colonel JOHNSTON. That is 16,242 pounds.

General PUTT. 16,242. That is just the bare weight of the engines.

Senator SALTONSTALL. That is the engine itself?

General PUTT. The engine itself.

Senator SYMINGTON. 33 tons, 76,000, something like that?

General PUTT. The total weight of 6 is 16,000 pounds.

Senator SYMINGTON. I see. 16,000 pounds.

What do you think the two engines weigh on the Russian commercial jet?

General PUTT. 10,000 pounds.

Senator SYMINGTON. Ten thousand. If they can push the same airplane of roughly the same size, based on the figures, the same performance roughly with 10,000 pounds that it takes us 16,000 pounds, how do you think that we can be ahead of them?

General PUTT. Well, they lose one and they are in trouble.

Senator SYMINGTON. You are talking about safety now, not performance.

If you were going to design an airplane, would you rather have the Russian jet, from what you know of it, or would you rather have ours at 16,000 pounds?

General PUTT. On a bomber?

Senator SYMINGTON. Well, any way you want it. You have a problem of weight on a bomber. As I remember it, during World War II, by all odds the biggest problem we had incident to performance was weight. If they are pushing the same airplane roughly on the basis of 10,000 pounds as against 16,000 pounds that it costs us to push it, how can you say we are ahead?

General PUTT. Let me clarify the question.

Are you asking would I prefer to have their Bison with the two engines as against our——

Senator SYMINGTON. I am not talking about the Bison now. I am talking about the Serov medium bomber type, their Badger.

General PUTT. Their twin engine medium bomber against our present B–47?

Senator SYMINGTON. Let me put it this way.

Would you rather be able to handle the same performance with 10,000 pounds, or 16,000 pounds?

General PUTT. If I had a choice of designing an airplane and had a choice of using 16,000 pounds worth of engine as against 10,000 with the same thrust, I would take the 10,000 pounds, the engines weighing 10,000 pounds.

Now, I would want to know more about the reliability and the performance of this 10,000-pound engine before I would say that this was definitely a good choice.

Senator SYMINGTON. Are you saying that you would rather have $20 than $10, but you would want to be sure that the $20 was not counterfeit; is that it?

General PUTT. That is one way of saying it.

Colonel JOHNSTON. Mr. Chairman, to correct for the record this question of the trust of engines, we were looking at different dash numbers of the engine.

The same dash number that you had has the same numbers in our book which is the YJ–75–P–3, so we were talking from the same book.

Senator SYMINGTON. We are in agreement on that, are we?

Colonel JOHNSTON. Yes, sir. I did not want to make it look like our records were wrong.

General PUTT. We have so many different models of some of these engines.

## "STATE OF THE ART" IN JET ENGINES

Mr. HAMILTON. General, you have testified that with research and development you are not only looking at the present but you are looking at capacity in the future in the same field. What in your judgment is our state of the art, if that is appropriate phrase to use, with respect to jet engines and the Russian state of the art with respect to jet engines at the present time?

General PUTT. I would think at the present time the general state of the art, and this covers a lot of fields of technology that go into the manufacture of jet engines, that we are ahead.

Mr. HAMILTON. Thank you.

Now, coming to air frames, what would your view be there as to our position vis-a-vis their position in the state of the art?

General PUTT. The state of the art?

Here I feel that we are ahead there.

Mr. HAMILTON. We are ahead?

General PUTT. Particularly in structures and in basic areodynamics as of today.

Again I am worried at the rate they are catching up.

Mr. HAMILTON. What is your view as to their position in the general field of radar?

General PUTT. Radar?

They have demonstrated a rather remarkable capability to produce some first-class radar equipment, particularly when one considers that their native ability, at least production-wise at the end of the war was

very meager if any. I think General Partridge has already testified to the effect that they had some equipment installed in the Far East that was probably equivalent to some of the equipment that we have in operation.

Now what they have got on their drawing boards or under development I am not sure but they certainly have demonstrated a capability of producing some good equipment.

Mr. HAMILTON. What would you say as to their general position from the standpoint of their capacity in the radar field of research and development vis-a-vis ours?

General PUTT. The state of the art you are now talking about?

Mr. HAMILTON. Yes; if by the state of the art you include their capacity to improve it.

General PUTT. Yes.

Mr. HAMILTON. There is a dynamic concept, so to speak?

General PUTT. Well, I think that we have a measurable lead. I want to leave out the word measurable because it is too hard to measure, but I think at this point we have a qualitative lead.

### SOVIETS HAVE TWO ADVANTAGES

As a general answer to your more specific question, Mr. Hamilton, I would like to point out that the Russians have the advantage of two technologies in their catching up process.

They have got the advantage of ours and their own.

Senator SALTONSTALL. Would you clarify that statement?

General PUTT. Yes. You see in the open literature where much of the results of our fundamental and basic research work is published; they have free access to this.

We gave them a lot during the war that gave them a start, so they have been able in many instances of not having to start from scratch.

In other words, they got up off the starting line with a good running start on the basis of what we had contributed and what they could find out by espionage and other means, and then they have always had a good capability in the basis sciences for years in the past.

### RELATIVE POSITION IN RADAR

Senator SYMINGTON. When you say that we are ahead of them, in radar, what do you base that on?

General PUTT. I have to base it on an overall qualitative judgment of other information available, as well as performance of items of equipment that we do have some knowledge of. (D)

Senator SYMINGTON. General Partridge testified as to the high technical competence of the Soviets in the radar field. (D)

Also, as I understood it, he felt they had better equipment in their radar defense than we do.

General PUTT. Was not he talking about the radars that they now had in operation in the Far East as against the radars that we had in operation in the Far East?

Senator SYMINGTON. I presume so.

General PUTT. Well, then in answer to the general question of where do we stand in the state of the art vis-a-vis the Russians, to get back to your point that you reminded me of, we don't know whether what

they have in the Far East is the latest, and we are sure that what we have over in the Far East is not the latest capabilities that we would have.

Senator SYMINGTON. But aren't we once more comparing, if we say superiority in this case, aren't we again comparing a prototype position with their production position, which is our current trick with respect to engines and planes, when we attempt to defend our position against Communist advances?

General PUTT. No, I think not in this case because we have equipments in production and installed in other places that are better than some of the equipment that we have out in operation.

Senator SYMINGTON. You mean the radar that we have in Korea, where we run into hot intercepts, is inferior to the radar we have installed in other places?

General PUTT. I think that is right.

Senator SYMINGTON. How about the radar they have in Korea, the Chinese Communists? Isn't that inferior to the radar that they have in East Europe?

General PUTT. I don't know. (D)

### R. AND D. FUNDS INADEQUATE

Mr. HAMILTON. Turning to the question of funds, you have mentioned these various factors that happened subsequent to 1953 and 1954 that increased your requirements for R. and D. funds.

What is your opinion as to the adequacy or inadequacy of the funds you have had available during that period for research and development?

General PUTT. In my judgment it has been inadequate.

Mr. HAMILTON. And what have been the consequences of that inadequacy, if any?

General PUTT. Well, the consequences of inadequate funds are usually this: One, there are things that you do not do that you think should be done.

There are things that are done at a slower pace than one would think they should be done. Here one gets into just a whale of a lot of judgment. Everyone will have different judgments as to how fast you should proceed with a particular development program. Everyone will have a different judgment on how big they think the development program ought to be.

### PROJECTS DELAYED BY SHORTAGE OF FUNDS

Mr. HAMILTON. And do you have any illustrations of things that you think should have been done that were not done?

General PUTT. While Colonel Johnston is picking out some dope I would like to speak in general for a moment.

One field of research and development effort which is common to most everything that we do is the materials field, whether you are talking about radar, whether you are talking about structural materials for aircraft or materials for engines, almost anything you can mention, materials are a large limiting factor, because if you do not have materials of high enough strength, if they won't retain their strength when they are operating at high temperatures, that

limits how far you can push the performance of the various equipments.

So there is a continuing need for work in the materials field, not only to develop new materials but to find out how to use those new materials and how to incorporate them into weapons systems.

Over the years we have done less in boundary layer control, which I can explain.

Mr. HAMILTON. Before you move on, is boundary layer related to materials, General?

General PUTT. No, I jumped to another subject.

Mr. HAMILTON. Do you have any figures on what your situation is with respect to research for materials?

General PUTT. We can give you a rough cut at that, because materials are scattered through our program in a lot of rather small projects.

In 1955 we had 8 million in materials research, in 1956 we had 9.4, in 1957 we will have 7.4.

In general I would say that that represents somewhere around 85 percent of what we think should be going into materials research and development.

Mr. HAMILTON. Now, turning to boundary layer control, would you describe first what that is?

General PUTT. Boundary layer control is a method of reducing the drag of an airplane. Of course it is the drag that limits how fast the airplane can go, how efficiently it will use the thrust that we have been talking about.

If one could reduce the drag of an airplane, cut it in half, for instance, then with the same amount of thrust, it would go roughly 50 percent faster.

This is done by controlling the very thin layer of air that is next to any surface that is exposed to the airstream. Theoretically if one could completely control this thin boundary layer over the entire surface of the airplane, you could reduce the drag of the airplane down to one-sixth or one-seventh of the drag that we now experience in aircraft.

Mr. HAMILTON. You mean you could eliminate 80 percent of the drag?

General PUTT. You could eliminate approximately 80 percent of it.

Mr. HAMILTON. Is that theoretically possible?

General PUTT. Theoretically possible, but practically I think it would not be possible for the foreseeable future to achieve all of that gain.

Mr. HAMILTON. How much do you think could be achieved?

General PUTT. Well, I think to start off with one ought to be able to achieve at least one-fourth of that, of the theoretical gain, maybe a third of it.

We can appreciate the dramatic results or the promises of doing some research in this field when one considers that if you could achieve the theoretical possible, the B–52 instead of weighing 400,000 pounds would weigh 90,000 pounds and do the same job. If you could just do the same job with an airplane that weighed 225,000 pounds instead of 400,000, this would be a tremendous gain. (D)

Mr. HAMILTON. And what would that be reflected in; what characteristics of the plane?

General PUTT. You can have a choice of how you would like to reflect those characteristics. You can take that gain in either decreased weight, holding the range the same, or you could still build a 400,000-pound airplane but essentially double the range, and then there would be some other gains in the altitude at which the airplane would operate and its high speed also. (D)

Mr. HAMILTON. And what has been your budget situation with respect to that program?

General PUTT. Boundary layer control we have had a $1,125,000 in 1955, $1,250,000 in 1956.

Mr. HAMILTON. Could you give us what you thought your requirements were in those years?

General PUTT. Yes. I can only give you the figures; what our requirements were in 1957.

Mr. HAMILTON. Very well.

General PUTT. We have a requirement for about $5.7 million and we will put about $1 million on the project.

Mr. HAMILTON. You get $1 million under your present budget?

General PUTT. Under our present financial plan we will have that much money.

Senator SALTONSTALL. Will the counsel yield?

Does that include the amount of money that the National Advisory Committee on Aeronautics has? They do a lot of that work.

General PUTT. This is correct, and the work that they do would be in addition to the dollars we are talking about here.

Senator SALTONSTALL. So that if there was an overall budget including the National Advisory Committee, you would have to include their work on this type of project; would you not?

General PUTT. If you were looking at the overall national effort; yes, you would have to include that.

You would probably find some money in the Navy's research and development program on boundary control also applied differently, following another technical approach to the problem.

Senator SALTONSTALL. That amount for the Advisory Committee is $70 million this year, I think.

General PUTT. That is right.

Mr. HAMILTON. Did you, in formulating your requirements, take into account these other sources that Senator Saltonstall mentioned?

General PUTT. Yes, indeed. Our programs are well coordinated.

Mr. HAMILTON. What other items, if any, do you have that have been either not taken up or delayed?

General PUTT. Our developments of radar, I think, have been slowed down over what would have been possible had we had more resources available.

Almost any of our missile and aircraft developments have not proceeded at what one might call an optimum rate.

Mr. HAMILTON. What do you mean by optimum, sir, in that regard?

General PUTT. To illustrate, one could carry out a research and development program so slowly that it becomes obsolete before you have completed it, like the GE engine.

Senator SYMINGTON. What GE engine?

General PUTT. The high-thrust engine that we will discuss a little later. It was the J–53. In such a case one has really wasted a considerable amount of money because when you get through, you really

do not have what you want. And as you extend the development time period, there is overhead which will eat up a lot of the research and development dollars so you are not getting a dollar's worth of the research and development effort for the dollars expended.

On the other hand you could just pour a lot of money into a project on what one might term a crash program, where you are really forcing things and doing a lot of duplication to make sure that everything is going to work. Here again you would spend a lot of money, more than necessary, to achieve a given result.

Somewhere between those two extremes there is a rate of development—it is not clearly defined, and again the matter of judgment enters—but there is a place where one will accomplish the project in a reasonable time, will do it just about as fast as the state of the art will permit it to be done, and the overall cost, not the annual cost but the overall cost, will probably be less than had you stretched it out or tried to crash it.

And certainly you do not want to have an "on again—off again" type of operation where you have to start it and stop it and start it again.

Mr. HAMILTON. Do you have any dollar figure in mind as to the difference between the funds you have gotten during the 4 years in question and what you think you would need to have an adequate research and development program?

General PUTT. In the 4 years, a total for the 4 years?

Mr. HAMILTON. How much money would you need in fiscal 1957 to give you what you would regard as an adequate research and development program?

General PUTT. Well in defense of our 1957 program before the House Appropriations Subcommittee, when asked essentially the same question, I testified that in my judgment we could profitably use between 150 and 200 million dollars more in 1957.

Since that time in the preparation of our 1957 financial plan, we have had to take a closer look at where the dollars were going and what our requirements were, and as of today I think I would have to revise that figure to say that something in the order of 200 or 300 million, roughly around 250 million, would be a proper figure.

Mr. HAMILTON. Now assuming that your budget for research and development remains at about the same level at which it has run for the past 4 years on the basis of the figures you have given us, what do you think will be the consequences insofar as our position vis-a-vis that of the Russians is concerned?

### LOSING GROUND RELATIVELY

General PUTT. If one takes the assumption that what appears to be their degree of effort continues, in my judgment our position would deteriorate.

Mr. HAMILTON. Deteriorate, you mean, relative to theirs?

General PUTT. Relative to theirs.

Mr. HAMILTON. You mean that they would be in a stronger position than we would be in?

General PUTT. I think they would be if we maintain a level dollar program.

Mr. HAMILTON. What effect, if any, would that have upon the quality of the elements in our air offensive power and our air defensive power?

General PUTT. Well, it will almost directly affect the qualitative aspects?

Mr. HAMILTON. In what regard?

General PUTT. Well, for instance, we probably won't be able to replace present radars with better radars as soon as we otherwise would if we had more effort going into radar research and development.

The rate at which new missiles or new aircraft or new bombing equipment or fire-control equipment are introduced into production and into inventory are delayed.

Again the matter of judgment: Do we need that qualitative advantage, rate of qualitative improvement or not enters the picture.

In my judgment I think we do.

Mr. HAMILTON. You think we do?

General PUTT. We do.

Mr. HAMILTON. Why is that?

General PUTT. Maybe it is an intuitive feeling based on an evaluation of many, many factors and a qualitative feel for where we are. Another reason is a concept or philosophy, if you wish, that I attempt to apply in my logic, if there is any logic to my reasoning.

First if we are embarked on a policy of not maintaining quantitative superiority——

Mr. HAMILTON. You are talking now in the field of airplanes?

General PUTT. Yes, the field of air power, however you want to classify it.

If we are not going to maintain quantitative superiority, then there must be a margin of qualitative superiority to offset the quantitative superiority that the Russians might have.

Let's assume that you just had enough qualitative superiority to offset the Russians quantitative superiority—if the problem were quite that simple, because it is more than just adding or multiplying a lot of figures together.

But if you just balance numerical and qualitative superiority, then you are just even with them, aren't you?

Mr. HAMILTON. Yes.

General PUTT. Therefore one must have an additional qualitative superiority over and above that to make sure that you have an advantage over them when you start.

On top of that additional qualitative superiority, you require another increment of qualitative superiority.

Mr. HAMILTON. Why is that?

General PUTT. A cushion, so to speak, because we will never strike first and this gives the Russians an additional advantage. Therefore I feel that there are three increments of qualitative superiority that we must have to make sure that, one, we deter war, or we can win if Russia starts one.

### UNITED STATES POSITION WILL DETERIORATE UNLESS POLICY CHANGE

Mr. HAMILTON. And what is your testimony as to the effect of our position upon that situation if we preserve research and development at the present level?

General PUTT. Our qualitative superiority will deteriorate.

Mr. HAMILTON. I know this is difficult and maybe you cannot answer the question, General.

What would you be talking about in terms of magnitude, orders of time?

Could you make any estimate?

General PUTT. I don't believe I quite understand.

Mr. HAMILTON. When do you think that we would lose our present qualitative advantage, assuming we now have it?

When would we either lose it or would it be diminished to the point where it would not offset their quantity, in your judgment?

General PUTT. This is the same question Mr. Symington asked.

Mr. HAMILTON. Don't you feel——

General PUTT. I don't feel that I would really be able to judge on that.

Senator SYMINGTON. I still don't follow. You would say that if this continues indefinitely, there could be no other possibility except their passing us in quality. Isn't that a fair statement?

General PUTT. Right; that is right.

Senator SYMINGTON. Now at the end of World War II, we had a line and they had a line. Our line moved up, as I understood your analysis, fairly orderly, in a straight line?

General PUTT. A gradual slope.

General SYMINGTON. Right.

And their line moved up, but at a steeper slope. Is that right?

General PUTT. Yes.

Senator SYMINGTON. If you said our line moved from 30 to 50 where would you say their line moved to, from nothing to what, as against our 30 to 50?

General PUTT. Here is where you are asking me a difficult problem because I used the illustration of the sloping lines, but the problem is we have no measure against which to plot the curve, so there is no index, let's say.

Senator SYMINGTON. You have never tried to plot out in your own mind any index incident to closing those two lines?

General PUTT. No, because any one line would be compounded of their rate of progress in every basic science, every engineering field.

### MILITARY POWER VERSUS COMFORT

Senator SYMINGTON. I understand.

In an article I read recently by a military analyst, he said in his opinion the Russian industrial complex was being utilized to generate power primarily, while ours was being utilized primarily to generate comfort and a better standard of living.

Would you agree to that?

General PUTT. I would think this was a fair statement.

Senator SYMINGTON. Have you any figures incident to how much they put in their industrial complex, their intelligence figures, in percentages, as against ours?

Mr. HAMILTON. That may be outside of the general's field?

To what exent, General, would you think it would be advisable in our research and development program to relate our effort to what we learn about Russian developments in the field?

General PUTT. Would you please restate that?

UNITED STATES RESEARCH AFFECTED BY SOVIET RESEARCH

Mr. HAMILTON. I say to what extent would you think it would be advisable to relate our research and development effort in the Air Force, of the kind covered by the figures you have mentioned, to developments by the Russians.

General PUTT. I don't believe I could answer that because I don't believe I have actually ever seen any figures on——

Mr. HAMILTON. I am not asking you to qualify it.

It was just a general question as to whether you felt we should respond to the knowledge that we gather as to their developments or whether we should pursue, so to speak, an independent program of our own.

General PUTT. I do not see how we can neglect to consider the Russian research and development program as revealed by intelligence, as one of the considerations in determining what we must do in specific developments or in determining the overall gross size of our research and development effort.

Mr. HAMILTON. You said fail to neglect. Is that what you mean?

General PUTT. We must not neglect what the Russians are doing as one of the factors in determining what we should be doing and the overall size of our effort.

It is the competition, and either you decide to meet the competition or you don't, and the consequences of not meeting it I think are just completely unacceptable.

Mr. HAMILTON. And do you think if the program continues at its present level, we will be meeting competition?

General PUTT. If their efforts continue at the indicated rate, we would not be meeting their competition, in my judgment.

Mr. HAMILTON. I think that is all, Mr. Chairman.

Senator SYMINGTON. Senator Saltonstall, do you want to ask any questions?

Senator SALTONSTALL. I would like to wait until tomorrow. We may be called any minute.

Senator SYMINGTON. Senator Duff?

Senator DUFF. I would just as well wait until tomorrow.

Senator SYMINGTON. All right, General, will you be back with us tomorrow afternoon at 2 o'clock?

We will be looking forward to seeing you.

(Whereupon, at 5:25 p. m. the committee was adjourned, to reconvene at 2 p. m. Thursday, May 17, 1956.)

# STUDY OF AIRPOWER

THURSDAY, MAY 17, 1956

UNITED STATES SENATE,
SUBCOMMITTEE ON THE AIR FORCE
OF THE COMMITTEE ON ARMED SERVICES,
*Washington, D. C.*

The subcommittee (consisting of Senators Symington, Jackson, Ervin, Saltonstall, and Duff) met, pursuant to notice, at 2:15 p. m., in room 457, Senate Office Building, Senator Stuart Symington (chairman of the subcommittee) presiding.

Present: Senators Symington, Jackson, Saltonstall, and Duff.

Also present: Fowler Hamilton, general counsel; Ramsay D. Potts, Jr., associate general counsel; Fred B. Rhodes, legal consultant to Senator Saltonstall; Edward C. Welsh, assistant to Senator Symington; and Wallace L. Engle, staff member.

Brig. Gen. Thomas C. Musgrave, Jr., Office, Secretary of the Air Force; Maj. Gen. Samuel R. Brentnall, Assistant Chief of Staff for Guided Missiles; Brig. Gen. Charles M. McCorkle, Deputy Chief of Staff for Guided Missiles; Lt. Col. William F. LaHatte, Office, Chief of Research and Development; Mansfield T. Sprague, General Counsel, Department of Defense; Capt. S. S. Searcy, Jr., United States Navy, Office of Chief of Naval Operations; Clarke Morgan and Bernard S. Bogdanowicz, Security, OSD.

Senator SYMINGTON. The committee will come to order.

General Putt, will you and Colonel Johnston and Colonel Reber consider yourselves sworn, as of yesterday.

I believe there are some further questions you would like to ask the witness, Mr. Counsel.

Mr. HAMILTON. Yes, sir.

Senator SYMINGTON. Will you proceed, please?

## TESTIMONY OF GEN. DONALD L. PUTT, DEPUTY CHIEF OF STAFF FOR DEVELOPMENT, HEADQUARTERS, USAF; ACCOMPANIED BY COL. ROBERT L. JOHNSTON, DEPUTY DIRECTOR OF RESEARCH AND DEVELOPMENT, DEPUTY CHIEF OF STAFF, OPERATIONS, HEADQUARTERS, USAF; AND COL. CARL J. REBER, CHIEF, PROGRAM FUNDING DIVISION, ASSISTANT FOR DEVELOPMENT, PROGRAMING, DEPUTY CHIEF OF STAFF, DEVELOPMENT, HEADQUARTERS, USAF—Resumed

Mr. HAMILTON. General Putt, directing your attention to the testimony you gave yesterday with respect to the funds available for R. and D. work, have your funds been adequate to maintain what you regard as an adequate program?

FUNDS INADEQUATE

General PUTT. I would say that they have not been.

Mr. HAMILTON. And what have been the results of that?

General PUTT. The results have been the deferment of the initiation of what I would consider rather important work that should be done or the stretching out of work that has been initiated to a completion date that is beyond that which could have otherwise been achieved.

Mr. HAMILTON. Could you give the committee examples of consequences of that kind?

LISTS IMPORTANT PROJECTS DEFERRED

General PUTT. I think that practically all of our propulsion work, with some one or two examples, that is jet engines, have been stretched out beyond what could have been accomplished with additional dollars.

We delayed the initiation of some aircraft weapons systems.

Mr. HAMILTON. What kinds of aircraft weapons systems?

BOMBERS

General PUTT. Such as a new tactical bomber; we have delayed the initiation of work on strategic bombers. (D)

This is not to say that we have not initiated the project but it has not moved as rapidly as it could have moved.

Our work on aircraft nuclear propulsion has been slowed.

Mr. HAMILTON. What kind of work would that have been?

General PUTT. Initially it would have been the experimental and research work on just the propulsion system itself, finding out how to build a reactor that could be carried by an aircraft.

NUCLEAR PROPULSION

Mr. HAMILTON. You are talking about nuclear propulsion?

General PUTT. That is correct. Later, of course, after we knew something more about the requirements of the propulsive system itself, then would be the proper time to initiate studies for the complete system, the airframe and all the work or all the subsystems that would go into the airplane to make it a military vehicle.

ELECTRONICS

There has been work deferred in the field of reliable electronics. We have not been able to carry on a program there of the magnitude that should have been carried on, and this, while it might sound like a rather minor element, relatively speaking perhaps low in cost, is vitally important because ofttimes the mission of a B–52 that costs us roughly $8 million a copy will have to abort because of the failure of 1, 2, or perhaps 3, electronic components.

Mr. HAMILTON. Does that have any consequences in the development of elements needed for defense or offense in the way of jamming and counter-electronic measures?

MISSILES

General PUTT. It would have its impact on both. I think one can say that our work could have progressed faster almost across-the-board in the field of missiles.

Mr. HAMILTON. Almost across the board?

General PUTT. Almost across the board.

Mr. HAMILTON. Why is that?

General PUTT. Well, there just were not enough resources to go around. The Snark program has been stretched from time to time in the past. I am sure we could have used additional funds wisely in the Navaho program. The Falcon program has probably not suffered to the same extent.

Mr. HAMILTON. Have limitation of funds in any way delayed or deferred work on missiles for penetration purposes?

General PUTT. They have. Both the initiation and certainly in 1957 work on those programs will be stretched over what we could do.

Mr. HAMILTON. You used the word "abort."

Did you mean "abort" in the sense that the aircraft might have to return, or "abort" in the sense that the aircraft might be lost?

General PUTT. In the sense that it might have to return.

RESEARCH AIRCRAFT

Another area is in research aircraft.

Mr. HAMILTON. What are research aircraft?

General PUTT. Research aircraft are those that we build to make aerodynamic exploration at very high performance. They are not designed as military aircraft.

An example is the X–1.

Mr. HAMILTON. What does the X–1 do?

General PUTT. The X–1 was the first aircraft that cracked the sonic barrier, the first one to go faster than the speed of sound.

Mr. HAMILTON. What kinds of military aircraft in that category would you have been working on if you had more funds?

General PUTT. We have had a considerable number of research aircraft that we have been working on.

There was the X–1, the X–2.

Mr. HAMILTON. What was the X–2?

General PUTT. The X–2 was a further extension of the X–1 class of airplane. One that is currently on the program, which is a joint venture between the NACA, the Navy and the Air Force, being technically supervised by the NACA, is the X–15. (D)

For next year, the fund requirement on that aircraft was 19 million. We have 8 million programed for it.

Mr. HAMILTON. Eight million programed?

General PUTT. Right.

Mr. HAMILTON. Could you supply for the record a statement of the various projects, your requirements for them and the amount of funds that you will have available for them in fiscal 1957?

General PUTT. In 1957?

Mr. HAMILTON. Yes, sir.

(The information requested has been supplied in classified form.)

SATELLITES

Are you doing any work on satellites, matters of that kind?

General PUTT. Yes, we are. We have been since 1946. (D)

Mr. HAMILTON. Are your funds adequate to continue that work with the activity that you regard as adequate?

General PUTT. The funds are not adequate.

Mr. HAMILTON. Don't worry about the precise amounts.

You can supply that for the record.

General PUTT. Roughly our requirement is 16 plus 7, about $30 million.

Mr. HAMILTON. You say 16 plus 7—30 million?

General PUTT. The total requirement for 1957 is about 39 million, of which 16 of that would be from funds other than P–600 funds, other than research and development funds. This leaves a total of 16 plus 7—23 million to come out of research and development funds. We have zero dollars programed against that project.

Mr. HAMILTON. Does that mean you won't be doing any work in the satellite field?

General PUTT. Except such funds as may be carried over from 1956. (D)

Mr. HAMILTON. Have you gotten any advise from your scientific advisers as to how long it would take to get such a satellite if you had the funds to do so, any judgment on their part?

General PUTT. Yes; we have. (D)

RADAR

Mr. HAMILTON. What about the field of radar? Are funds restricting your research development activity in that field?

General PUTT. They are. As a matter of fact many of the items in the Killian report were radar items because they saw the necessity for greatly improved radars to assist our air-defense system, radars that would be good to greater altitudes, out to greater altitudes, and to greater distances. We currently are working within limits of our resources on large, heavy radars for detection and warning against incoming Russian ICBM's.

Mr. HAMILTON. Are your funds adequate in your opinion for that project?

General PUTT. They are not adequate for that.

I retract that. Because we think this is a high priority program, our funds programed against the requirement cover the requirement.

Mr. HAMILTON. For what period are you talking about?

General PUTT. This is just for 1957.

Mr. HAMILTON. Have they been adequate in previous years?

You can answer that if you care to in the record.

General PUTT. Yes; I think we would have to say that they were essentially correct, because it is only very recently that we have established the feasibility and have known how to do it. I do not think we could say lack of funds have held us up there either in the initiation, or in the work since it has been initiated.

Where we will suffer is next year when in our best judgment $34.4 million could be profitably used in work on a project for direct defense against long range ballistic missiles.

Mr. HAMILTON. What funds would you have available for that as plans now stand?

General PUTT. We will have available $2 million for that particular project. (D)

This is not an easy problem. There is still a lot of research and development work that will have to be done.

Mr. HAMILTON. You said that you thought you needed something in the order of 30 million?

General PUTT. Thirty-four million.

Mr. HAMILTON. Thirty-four million, and that you have available two?

General PUTT. Two.

Mr. HAMILTON. To what extent would the failure to have the additional 32 million retard your work in that field?

Would it retard the work directly proportionately or not?

Is that question clear?

General PUTT. Yes; it is clear.

Mr. HAMILTON. It is conceivable to me that with $2 million you could do more than one-sixteenth.

On the other hand it might be that with 2 million you could not do as much as one-sixteenth or you could do just one-sixteenth. There are three possibilities.

General PUTT. Because the later stages of the program cost so much more than the earlier stages I would say we will do more than one-sixteenth for that 2 million, but it would seem to me that with this as a trend, if the same kind of deficiencies existed this would stretch out for many years over what might be possible if one had all of this money.

Mr. HAMILTON. Do you think it would significantly delay development?

General PUTT. Yes; it would, that is right.

Mr. HAMILTON. Are there any other items of this kind that you would care to mention?

OTHER FIELDS OF PROPULSION

General PUTT. We have not definitely firmed up on what the actual requirement is, but there appears to be good feasibility and much promise in the field of propulsion. (D)

This gives you an order of magnitude of promise.

I do not know that we could achieve that much of an improvement in practice, but this is the promise that one sees if more work could be done.

For next year we are not talking about great sums of money, which at this point we do not appear to have. At this point there is no money funded against it. However, this does not mean that there is no work being done by others. (D)

Mr. HAMILTON. What would be your requirement for the initial work of that project? You can supply it for the record if it is not handy.

General PUTT. We can supply it.

(The information requested has been supplied in classified form.)

Senator SYMINGTON. Excuse me a minute.

Young man, will you come forward a minute, please. Which one of you is in charge?

Mr. MORGAN. I am, sir.

Senator SYMINGTON. What is your name?

Mr. MORGAN. Mr. Morgan, sir.

Senator SYMINGTON. And whom do you represent?

Mr. MORGAN. I am from OSD Security Office.

Senator SYMINGTON. Yesterday when I went into the washroom while the briefing was going on, well after 5 o'clock, there was nobody there. Why was that?

SECURITY CHECK OF HEARING ROOM

Mr. MORGAN. Sir, we do not always stay for the full period. We run through our procedure 2 or 3 times and then sometimes leave.

Senator SYMINGTON. What hours do you observe?

Mr. MORGAN. Well, for instance here instead of quitting while you people are all here we will stay with you.

Senator SYMINGTON. What time did you leave yesterday?

Mr. MORGAN. 4:15.

Senator SYMINGTON. And what time did you leave the day before?

Mr. MORGAN. I don't believe there was anything Monday.

Senator SYMINGTON. Then the last time before that what time did you leave?

Mr. MORGAN. Six o'clock, I believe it was Friday night.

Senator SYMINGTON. I noticed it and some people mentioned it to me.

Are we to understand this is a periodic test, or a constant test?

Mr. MORGAN. Well, we figure that if anybody was going to get anything out by that late period, they would have started a transmission out of there by then.

Senator SYMINGTON. Don't you think if anybody was really interested in bugging the room of a hearing like this, that they would know when you came in and when you left?

Mr. MORGAN. I was told yesterday, sir, that the meeting was about over and that you were going to vote at that time so I figured the hearing itself was over.

Senator SYMINGTON. We are not asking you this in any criticism. I have heard a good many briefings in this building, on far more secret things than we are discussing. We have never had this routine before to the best of my knowledge. We periodically check the committee rooms if I remember a statement made by the chairman of the full committee.

As we do with all other witnesses, will you raise your hand and be sworn, please?

Do you swear that you will give the truth, the whole truth, and nothing but the truth to this Senate Subcommittee on the Air Force of the Senate Armed Services Committee, so help you God?

Mr. MORGAN. I do, sir.

Senator SYMINGTON. Will you give us details as to whom you report and what your instructions were when you came over here and what we are to expect in the future?

Mr. HAMILTON. You can supply that for the record.

Mr. MORGAN. At a later date?

Senator SYMINGTON. At a later date.

Mr. MORGAN. All right, sir.

(The requested information is as follows:)

I, Clark A. Morgan, a representative of the Office of the Secretary of Defense, Security Office, make the following statement for the record in compliance with a request of May 17, 1956, by the chairman of the subcommittee.

The standard operating procedure of this Office normally consists of a visual inspection and radio monitoring of an area immediately prior to a conference to insure that no clandestine listening devices are in operation within the area. Spot monitoring is also conducted during a conference to insure that no remotely controlled clandestine transmitters are put into operation during a conference.

The procedures used during the present closed hearings of this subcommittee consist of the above-listed standard operating procedure or 1 of the 3 variations listed below:

(1) If a closed session immediately follows an open hearing, time does not permit a complete visual inspection of the area and only the radio-monitoring phase is conducted.

(2) Radio monitoring is conducted for approximately 3 hours if the monitoring is conducted from an area immediately adjacent to the conference room, and if the departure of the monitoring team would create no undue disturbance or attract attention.

(3) If the monitoring is conducted from the conference room itself, the monitoring team remains until the session is concluded to prevent interruption to the hearing by the packing of monitoring equipment and departure of the monitoring team.

In the future the procedure in covering the subcommittee will follow the above-listed standard operating procedure, or one of the three variations, unless otherwise directed.

PROPULSION RESEARCH

Mr. HAMILTON. We were talking about research on these propulsion systems, ram jets, and rockets, General Putt.

General PUTT. They show great promise, sir. This is perhaps illustrative of an area in which the breakthrough might occur that would require taking maximum advantage of such a breakthrough and would justify it, the application of even more funds than one would program at the beginning of a budget cycle.

SECURITY CLEARANCE

Senator SYMINGTON. Colonel, will you identify yourself, please?

Colonel LAHATTE. I am Colonel LaHatte.

Senator SYMINGTON. You have been with the committee before. What are your clearances?

Colonel LAHATTE. Top secret.

Senator SYMINGTON. Would you give your name to the reporter.

Colonel LAHATTE. I believe he has my name.

Senator SYMINGTON. We desire not to have any leaks; and I know that counsel for the Defense Department appreciates our interest. We had somebody challenge the colonel who came before you, and I appreciate receiving this letter from you for the record:

*To Whom It May Concern:*

This is to certify that Lt. Col. William F. LaHatte, ASN 20426, has a final top-secret clearance in a need to know concerning the matters now being reviewed by the Subcommittee on the Air Force. It is requested that Lieutenant Colonel LaHatte be permitted to attend the hearings the 17th and 18th of May 1956.

Colonel, we welcome you with us. We wanted to be sure that the new face was identified.

General Brentnall, I assume you are speaking for the general on your right?

General BRENTNALL. General McCorkle.

Senator SYMINGTON. Will you proceed, Mr. Counsel?

POSSIBLE SCIENTIFIC BREAKTHROUGH

Mr. HAMILTON. General, you were saying this is the field where it might be possible that a breakthrough would occur.

General PUTT. That is correct. Just the establishment of the feasibility can almost be considered as somewhat of a breakthrough because up until quite recently we have not thought there was a lot of promise.

Mr. HAMILTON. Do your scientific advisers advise you that there is some promise in this field?

General PUTT. This is correct. Our own scientific advisory board recently examined this field.

Mr. HAMILTON. Do you have any other illustrations that you would care to mention in this same category?

General PUTT. It might not sound like a very important item, but all of our work in attempting to lay out our research and development program and determine where we should put our money next, requires a lot of planning.

We do this planning by having industry and other organizations make technical studies for us. This is one way we keep track of the state of the art.

The operational commands tell us what they would like to have and we have to tell them what they can get, what it is possible to get.

So a very important segment of our program are these technical studies. You might go off and say to 2 or 3 different companies, "We are interested in a new type airplane. Here is the statement of requirements of what we would like to have, we want you to make some generalized studies and come back and tell us what is feasible and what is possible within a given time period."

DEFERRED PROJECTS LIST CONTINUED: TECHNICAL STUDIES

For next year the money that we will have to put on these studies which would have a great influence on our programs for 1958, 1959, and beyond are reduced to practically zero.

It does not sound like a very interesting item, but it is an essential part of our research and development program in order to be able to spend most effectively the money that we do have.

We mentioned briefly yesterday the field of research generally which really is the seed corn and the foundation of everything that we do.

At present we are expending in what our budget labeled as research at a level of about $20 million per year. This is the sort of research that you do not tie to numbers of new models of operational weapons systems or things of that nature. It is the research and development program that one tries to maintain a rather stable effort in. It is not susceptible to great increases. Decreases are bad, too. In order to keep our work in balance between research, technical developments, and the operational systems, we think that work in this area should increase over the next 3 or 4 years to where we would have a research program that would equal about $50 million a year.

Mr. HAMILTON. How much did you recommend for fiscal 1957 in that regard and what did you receive?

General PUTT. Our requirements were 28 million as the initial step toward the fifty.

We have programed essentially the same as we had last year, which is $20 million.

FUNDS FOR PROTOTYPES LIMITED

Mr. HAMILTON. Directing your attention to aircraft, are your funds adequate to produce a suitable number of prototypes of aircraft?

General PUTT. We are essentially limited to producing one prototype for each type of aircraft that we require.

In other words, if we need a new day fighter, a new tactical bomber, we are essentially limited to building just one.

Mr. HAMILTON. Has that always been the case?

Have you always followed the practice in the Air Force?

General PUTT. No, sir; we have in the past had the opportunities and the resources to build more.

Mr. HAMILTON. Can you give any illustration of that?

General PUTT. Perhaps the best example with which the committee would be familiar occurred in 1946 when we were first getting into jet bombers, the medium jet bombers. We initiated and built 4 prototypes, the B–45, which served a useful purpose in combat, the B–46, which was dropped, and the B–47, which you are all familiar with, and the B–48, which was dropped.

There we had a choice of four airplanes just within the medium bombardment field.

Mr. HAMILTON. Was that a provident or an extravagant way of doing it?

General PUTT. It costs a lot of money, but it is a rather intelligent way to do it if one can afford it.

Mr. HAMILTON. Why is it intelligent?

General PUTT. Why is it intelligent?

Because the very nature of research and development does not guarantee that every project is going to pay off.

So if one only has one choice, and for some reason or other that turns sour, and if you have planned that prototype on a time cycle so that it is going to be the replacement for what is currently in operations, and then it falls by the wayside, or turns out to be a lemon, you are stuck for an inventory replacement.

You then have to start over on something else or accept a lesser performance, by trying to cure the defects. Sometimes you turn up with something that is usable; yes; but not as good as if one had had a choice.

POLICY MATTER

Mr. HAMILTON. Is the production of the one prototype a matter of lack of funds or is it a matter of policy?

General PUTT. I guess I would answer that it is policy because of the lack of funds.

Mr. HAMILTON. Is that true of all types of aircraft on which you are working, that you are working just to produce the one prototype?

General PUTT. That is correct. However, I would want to qualify that a little bit. It is not quite as black as it has sounded up to this

point because we do usually start initially with competitive studies by 2 or 3 contractors. If we had the funds we certainly would like to carry 2 or 3, a minimum of 2, through at least to a mockup.

Mr. HAMILTON. Is there a difference between the mockup and the word "prototype" that you have been using?

General PUTT. Yes, there is. A mockup is just a full-scale wooden replica of what it is you propose to build. Its greatest utility is to make sure you can get all the bits and pieces together with no interferences.

A prototype is actually something that will fly and perform as the final weapon.

Mr. HAMILTON. Is it the case now that you go through the mockup stage?

General PUTT. No. We have had to terminate some of our projects before we have reached the mockup stage.

Mr. HAMILTON. How many different types of aircraft are you now working on in research and development?

Maybe you could supply that for the record if you would care to.

(The information requested has been supplied in classified form.)

Are you working on more than one?

DEFERRED PROJECTS LIST CONTINUED: TEN, FUEL RESEARCH

General PUTT. Oh, yes; another area that I think is important where we are lacking in resources is in the area of high-energy fuels. This shows great promise of substantial increase in range of existing aircraft. Ⓓ

General PUTT. The program could be expedited. Ⓓ

Mr. HAMILTON. I suggest, General, that maybe at this point it might be well if you have any other illustrations, just supply them for the record.

That concludes my questioning.

(The information requested has been supplied in classified form.)

Senator SYMINGTON. Mr. Counsel, we will go back to you whenever you have any more.

Senator Saltonstall?

Senator SALTONSTALL. Thank you, Mr. Chairman.

General Putt, I just have a few questions, mostly on these figures. Now there are today certain emergency funds which can be used for research, are there not, more this year than ever before?

There is an $85 million fund which I will call your attention to, and then there are $50 million more which can be transferred from other funds, making a total of $135 million that is available at the discretion of the Secretary of Defense for research.

Do you agree with that?

General PUTT. You are speaking of fiscal year 1957?

Senator SALTONSTALL. That is right.

General PUTT. Yes, sir.

Senator SALTONSTALL. That is what we are talking about really?

General PUTT. Right. Those are the correct figures.

FUNDS VERSUS SUPPORT OF BUDGET

Senator SALTONSTALL. Now as a matter of fact you are a pretty consistent fellow as I have been listening to you.

Before the House committee you stated—

We rather constantly review our requirements. We feel we can profitably and effectively use more funds in some very important work. We are not asking for more money at this point, but we feel we could use more money profitably.

Then again you said in talking about Mr. Quarles—

That is correct. I have a great respect for our Secretary also. I accept his judgment and therefore support this budget we are asking for.

You still stand by those statements; don't you?

Senator SYMINGTON. If I may ask the Senator to yield here a minute.

The question in effect, General Putt, is whether or not you mean what you said here this morning, or whether you meant what you said before that committee.

I know the distinguished senior Senator from Massachusetts will bear with me when I say I believe what has just been read to you is one more case of the type and character of pressures put on officers to support the budget. I was once part of that system in the Pentagon for many years, and believe it fair to point out to the witness at this point, that I am sure he remembers in this hearing he has the advantage of having raised his hand and being sworn, regardless of any pressure; so he is in position to tell the committee the truth, as he sees it.

I thank the Senator for his indulgence.

Senator SALTONSTALL. Mr. Chairman, I made my first statement by saying I thought the general was consistent.

I am sure from looking at him and knowing his record that he would tell the truth anyway, at least I hope he would.

Senator SYMINGTON. I have sat and listened to the distinguished senior Senator from Massachusetts too often not to recognize fully when the witness is being carefully mousetrapped on a particular question.

Senator SALTONSTALL. Mr. Chairman, you give me more credit than I believe I am entitled to, or at least that I have ever felt that I have.

Senator SYMINGTON. I tell my colleague with affection and respect that I have no more admiration for him than I give him credit for.

Senator SALTONSTALL. General Putt, there is that emergency fund.

General PUTT. This is correct; yes, sir.

### FUNDS FROM OTHER SOURCES

Senator SALTONSTALL. Now I heard—I use the word "I" because I sat in on the Appropriations Subcommittee—I heard some interesting testimony yesterday and I would be interested in this and I would like to know whether you generally agree with this.

I think it was Mr. Furnas—he was testifying and he said that there were approximately $15 billion, that is speaking of the whole Defense Department, the Army, the Navy, and the Air Force, that were set aside for procurement, budgeted for procurement, and out of that $15 billion, approximately $3 billion were used in development and research and prototypes.

Now do you broadly speaking agree with that?

I don't ask you for the overall figures because that is beyond your department, so to speak.

But there are certain funds that are available for research and prototype work that come out of the procurement funds, are there not?

General PUTT. That is correct.

Senator SALTONSTALL. And when Assistant Secretary Furnas says that that in his opinion is about $3 billion overall, you would not dispute that figure, would you, from your knowledge?

General PUTT. As an order of magnitude I would not, I don't believe I would dispute it.

It is a very difficult figure to get a hold of.

Senator SALTONSTALL. I agree.

General PUTT. And how big or how small it is is dependent upon what kind of funding ground rules one uses in arriving at that figure?

Senator SALTONSTALL. Now you testified, and it may be a little difficult for me because of the difference in the use of funds that were given to your department.

### CHANGE IN BOOKKEEPING

Is it not true that a year ago a new system of bookkeeping was started?

In 1954 a new system of bookkeeping was started which changed the methods by which the various divisions got their funds, and so on.

General PUTT. That was in fiscal year 1956 that I referred to a change in the bookkeeping.

Senator SALTONSTALL. That is correct.

General PUTT. Yes.

Senator SALTONSTALL. Now what that will eventually evolve into as I understand it is not necessarily a smaller amount of funds coming to you, but a different method of approach so that your budget figures, the figures given to you in the budget, will ultimately get to you but they will get to you in a little different time perhaps or in a little different method than they formerly did get to you; is that right?

Do you agree with that?

### BOOKKEEPING CHANGE DOES NOT RESULT IN MORE FUNDS

General PUTT. No; timewise I think their availability for use within the Air Force was essentially the same.

In fact, I cannot think of any reason why there would have been any difference in the time. Of course the bookkeeping change has not increased the overall availability of funds for the work to be done.

Senator SALTONSTALL. It is an effort to put into practice title IV of the Unification Act amendments of 1949.

I will make that as a statement to you.

And they are in effect as I understand it in the Army and the Navy and they are beginning to go into effect in the Air Force.

I assume that that is what you mean.

You are beginning to feel them and that is why you state those figures.

Senator SYMINGTON. If the Chair may make this comment, this witness is an expert in the field of research and development. He is not an expert in the field of money, nor in the field of fiscal policy, as I understand his testimony. The counsel spent considerable time with him to develop whether or not he had the money he thought necessary, regardless of title IV, section 5.

He says he has not had the money in some places; and in other places he has.

I do not think the witness can be interrogated as a fiscal witness, and am confident he does not know any more about title IV than I do; and I have read it many times.

I would hope the witness understands he does not have to answer this intricate fiscal question unless he fully understands the question.

I would be unable to answer that last question myself.

Senator SALTONSTALL. What I am trying to say is that the figures used by the General yesterday were difficult for me because they were so different from the figures that I heard in the morning on the same subject and what I was trying to bring out was that there has been a change in bookkeeping methods in the Department of Defense, and they hit the Air Force for the first time, as the General said, last year, and that may account for some of the differences in these funds, in the amounts of the funds that you have heard as opposed to the amounts of the funds that I have heard.

Senator SYMINGTON. Last year I attended meetings of the Senate Subcommittee on Military Appropriations of the Senate Appropriations Committee and after the regular members of the committee interrogated witnesses, it was considered proper for me to interrogate witnesses for which I am very grateful.

This year the chairman of that committee has been kind enough to offer again that I be with the committee and interrogate witnesses.

COMPARISON WITH OTHER BUDGET FIGURES

The Chair felt it would be inadvisable to clog up with the question of appropriations these particular hearings and therefore is not attending the appropriation hearings.

I hope these hearings will get the facts out to the people with respect to our airpower. I honestly have felt for many years that the way we tie in the question of appropriations with other facts incident to the services sometimes clouds the issue. I would hope that if we are going to balance what is being said here against that said in the morning at the Appropriations Committee, and I believe the senior Senator from Massachusetts is the only member attending the latter hearings the Chair be allowed the chance to study those appropriations hearings in detail in order that I may be more intelligent about it.

Senator SALTONSTALL. All I say, Mr. Chairman—I don't want to clog the record unnecessarily but the General has testified that he needs more funds and that he has been needing more funds for this purpose and that purpose and all I want to try to put into the record, and I think it would be quite proper to put into it, is the amount of funds that the Department or the Air Force is getting for research in 1957.

I do not question for one moment General Putt's ability as a researcher and I will not try to dispute any statements he makes as to the size of the hole that the jet flame has got to go through in order to give a bigger thrust, but I do want to discuss the amount of money.

I am not going to take but a moment more.

General, I have a few figures here which I would just like to see if you agree with which are budgetary figures.

You testified to the budget before the House and I assume that you will testify before the Senate.

Now there is an overall schedule entitled "Activities Supporting the Research-Development Test and Evaluation Program in the Department of Defense."

Mr. Chairman, I would like to put that in the record if the counsel would approve. A few of these statements I have taken from it.

Senator SYMINGTON. Now let's see what this is you have here.

Senator SALTONSTALL. It was submitted by Mr. Furnas yesterday.

Senator SYMINGTON. And what does it represent?

Senator SALTONSTALL. It represents the activities supporting research and development test and evaluation programs.

Senator SYMINGTON. I do not want to see entered into this record any document not signed and accredited, which might in any way nullify the witness' testimony.

It is not signed.

If the document is in effect contradictory to the testimony that has been presented, I would like to submit it first to the committee for discussion.

Senator SALTONSTALL. Mr. Chairman, most respectfully if you doubt my word I will get this over the signature of Mr. Wilson. To the best of my knowledge it is a statement that was submitted to the Appropriations Committee. It is in the record of the Appropriations Committee.

Senator SYMINGTON. I would never doubt your word, Senator. I thought you said you assumed.

Senator SALTONSTALL. I am taking their word it was submitted at the time of Mr. Furnas' testifying before the Appropriations Committee.

Senator SYMINGTON. Let's see what it is exactly.

Activities supporting the Research and Development test and evaluation program of the Department of Defense, Army, Navy, and Air Force Emergency Fund.

Is that correct?

Mr. HAMILTON. Senator Saltonstall, it might be useful if we said it had been submitted as prepared by Secretary Furnas, so the record will show.

Senator SYMINGTON. You are asking us to identify the document. You have figures here for the Navy, Army, and Air Force.

Senator SALTONSTALL. Total research.

Senator SYMINGTON. It is 4½ pages.

I don't know what it is. I will put it in the record here at this point if you so want, based on your statement of what it is.

Senator SALTONSTALL. If there is any question in your mind I will have a covering letter on that.

Senator SYMINGTON. It is not necessary; but I ask that if there is any part of this document, figures or facts, implied or stated, with which the counsel does not agree, or anybody else on the committee does not agree, that we put in an additional document, at the same place this document is inserted.

Senator SALTONSTALL. Mr. Chairman, I am putting it in because I want to quote from it.

I have some figures here I want to quote from and before I did I wanted to show that to you and Mr. Hamilton.

Senator SYMINGTON. Without objection, this document will be entered.* We will analyze it from the standpoint of possibly adding another memorandum to the record.

Senator SALTONSTALL. General Putt, I just want to ask you a few questions on your appropriations as you understand them and see if you disagree or agree.

The figures I am going to quote are the figures regarding the Air Force research which have been taken from that paper that has just been put in as an exhibit.

Air Force research and development appropriation new obligational authority for 1957 is quoted as follows:

Fiscal year 1955, $424.4 million; fiscal year 1956, $598 million, and requested for the fiscal year 1957, $610 million.

And in addition to that the Secretary of Defense, as I stated, and you agreed, has an emergency fund which he is permitted to transfer to the Army, Navy or Air Force as the need arises, and this emergency fund, if you add the $50 million of transfers, amounts to $135 million.

Senator SYMINGTON. I believe that the distinguished Senator is quoting obligational authority, and the General is quoting expenditures.

General PUTT. Correction——

Mr. HAMILTON. I think I understood the general's response was not "correct," sir, it was "correction."

General PUTT. Correction, yes.

Senator SALTONSTALL. I did not understand.

Mr. HAMILTON. I think Senator Symington got the impression from what the witness said that the witness was agreeing with Senator Symington.

Senator SYMINGTON. I did.

Mr. HAMILTON. I gather what the witness said, instead of "correct," sir, was "correction," just to be sure the record is clear on that. You had asked him, Senator, as I recall, about these figures.

Senator Symington said he thought he was talking about expenditures, and at that juncture the general, as I heard him, said in substance he wanted to make a correction.

General PUTT. Yes, sir.

First, I should state that to the extent you have identified the figures we are working with the same basic figures and, therefore, ours are consistent, although they may not be exactly the same.

We can explain the differences.

Senator SALTONSTALL. That is what I want to do now. There is another set of figures that I would like to ask you about, if you know. If you don't know, say so.

Supporting activities directly related to research and development in the Air Force, the figures are here for 1955, 1956, and 1957 fiscal years.

They are for military construction, industrial facilities, and military personnel. They amount in 1955 to $255 million—$255.3 million; in fiscal 1956 to $290.4 million; and in fiscal 1957 to $383.6 million.

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*The document referred to will appear as part of the published record at a later date.

Now, those are, as I say, in that group of figures that I gave you. Those are supporting activities directly related to research and development.

Are you familiar with those figures?

General PUTT. I am not familiar with them as of this moment. I am sure that we have them in our files. This includes military construction for research and development; it includes the pay of military personnel which are assigned to research and development activities which I testified yesterday was exclusive of the so-called P–600 funds.

Senator SALTONSTALL. Industrial facilities?

General PUTT. And industrial facilities, which is the project 131 funds that I mentioned yesterday.

Senator SALTONSTALL. Now, also in those same set of figures, the development, test, and evaluation items for the Air Force, which exclude procurement items standardized or approved for service use, these figures include aircraft, guided missiles, and others, the totals in 1955 are $1,419.9 million; in 1956, $1,256.0 million; and in 1957, $1.731.4 million.

Now, those are figures that are in this year's budget that are taken for the development, test, and evaluation items.

You would not dispute that those figures were correct?

General PUTT. I could not testify as to the accuracy, and, further, I don't know where they came from. There is some support from the production funds which we talked about yesterday, but I could not make any comment as to their accuracy.

Senator SYMINGTON. General, you are under oath. I would urge that if you are not sure of the facts, because you may go into another hearing, and this may be read back to you again, you are at entire liberty, any time you are not sure of your facts, to say you do not know.

Senator SALTONSTALL. That is entirely satisfactory. What I am trying to point out, General, is that which the budget would show was in the research effort of the Air Force, the Navy, and the Army.

Now the research, development, test, and evaluation and supporting activities of the Department of Defense summary, this summarizes the Air Force figures that I have used, totals by service in 1955, $2,095.6 million; in 1956, $2,144.4 million; and in 1957, $2,725.2 million.

Are those the figures as I understand it that are assigned by the Department of Defense to research effort of the Air Force?

In other words, they say that there are $5.2 billion assigned for all such activities for the entire Defense Department; of which $1.6 billion is purely for research, but an overall amount of $5.2 billion including funds out of procurement and other budget categories. You have no reason to doubt those figures, have you?

General PUTT. I don't know. I don't know how they got them.

Senator SALTONSTALL. But you agree that there is money for research coming out of these other accounts?

### FUNDS FROM OTHER SOURCES NOT THE SOLUTION

General PUTT. I so stated yesterday, but could I make an additional statement that I think might clarify a lot of my previous testimony, and I mentioned to counsel that I ought to make this clarifying statement today.

We have talked essentially about the research and development funds that are classed as research and development, the P–600 series in the Air Force.

When I state that our research and development budget is inadequate, when I state that we need more money to do this and to do that, and when I talk about our total research and development program, I am taking into account at all times, because it is the only way we can manage a research and development program, the total job that is being done or not being done irrespective of the source of the funds. So that when I say we are not doing enough in a particular area, and that we need more funds in the P–600 area, I have taken due account and made due allowance of all the work that is being done by all other funds regardless of their sources.

And that is a general statement that applies to anything that I have said or might say about our overall research and development program.

Senator SALTONSTALL. There are funds that support the research and development programs of these various units, and just see if you and I agree on these.

First in the departmental administrative costs, some money comes out of that for research, does it not, departmental administrative costs?

General PUTT. There are funds that are allocated to the support of headquarters, things of that nature, administrative costs.

Senator SALTONSTALL. Second, the regular operating and maintenance costs of military ships, aircraft, and troop units used in conducting tests.

We have already talked about that.

Three, the pay and allowances of military personnel attached to regular military units used in conducting tests other than specific operational evaluation organizations.

General PUTT. I testified that those funds are also used.

Senator SYMINGTON. I did not hear you. Will you repeat that?

General PUTT. I testified yesterday that those types of funds are in support of research and development.

Senator SYMINGTON. If the Senator will yield a minute, wasn't this part of the testimony you gave to Mr. Hamilton, in reply to previous detailed questions?

General PUTT. Yes, sir.

Senator SYMINGTON. Senator Saltonstall?

Senator SALTONSTALL. Four, costs which are part of the production contracts required for the further development of standardized items which must be adapted to other uses or approved in performance.

Mr. HAMILTON. Would you mind saying "yes" or "no," since the reporter can't record the nod?

General PUTT. I would question whether that is identifiable as research and development. It is model improvement. Some people will include that in the definition of "research and development." Others will say that is just production improvement.

Apparently the Department of Defense has included that all in research and development.

Senator SALTONSTALL. Well, we would have to take what you testified about radar and improving the methods—it begins with a "t," what is the word that begins with "t," that you used?

General PUTT. Transistors.

Senator SALTONSTALL. Yes; improving a transistor could be called research.

General PUTT. Well, the deficiency in funds that I was talking about was for work that could only be funded out of research, strict research and development funds, and of course had taken into account what is done with these funds.

Senator SALTONSTALL. I used that as an example.

Five, the regular military costs associated with operational and training units required in the process of phasing out obsolete weapons and phasing in improved weapons, such as the changeover from propeller-driven aircraft to turbojet aircraft.

General PUTT. I would not class that as a research and development expenditure.

Senator SALTONSTALL. You would not agree that funds that were included for that purpose in the budget could be defined as "research funds"?

General PUTT. Not as I understand the definition as you have just read it.

BUDGET GUIDELINES

Senator SALTONSTALL. Mr. Hamilton yesterday brought out these guidelines.

You did not have the guidelines for 1957; you had guidelines for 2 previous years.

Do I understand those correctly—and I never heard about them until yesterday—that those are what you might call overall generalized instructions that are given to you within which you must operate?

General PUTT. That is right.

Senator SALTONSTALL. If I am correct in assuming in reading those, there is a clause in there which states in substance that if there is something that you have found that is mighty important, you can go back and try to get more money for that. Is that correct?

General PUTT. Yes, out of the emergency fund and transfer authority which for 1957 totals $135 million I believe. This in fact accounts for some of the discrepancy between the figures that you were quoting in the P–600 funds and the ones that I had given yesterday in that the figures that we gave for 1956 and prior years included only the original appropriation but added to those are the funds given to the Department of the Air Force out of the emergency funds and transfer authority during the year.

EFFORT TO GET MORE FUNDS

Senator SALTONSTALL. What I am getting at, General, you have a fine reputation, you are the head of the research of the Air Force. You have considerable discretion and get considerable help to use your judgment, to exercise and carry out your judgment if you find that you have got something that is on the ball.

General PUTT. Yes.

Senator SALTONSTALL. In other words, if you got something awfully exciting and can present proof of that, persuade Mr. Quarles or the new assistant secretary in charge of research that it is exciting, they let you go forward, don't they?

General PUTT. I can assure you I leave no stone unturned to obtain additional funds when I have something exciting.

Senator SALTONSTALL. What is that?

General PUTT. I can assure you I leave no stone untruned to obtain additional funds when I have something exciting.

### HAPPINESS VERSUS FUNDS

Senator SALTONSTALL. From listening to you here, I am sure you are right. I don't think I have anything more.

Thank you, General.

General, you are not unhappy with what you find you have. You would like to have more, like all of us.

Senator SYMINGTON. Wait a minute, I don't like catch questions. Senator, I have seen too many fellows dig their graves, answering such questions for the last 3 or 4 years.

I think we ought to define unhappiness if you are going to ask such an abstract question.

Senator SALTONSTALL. Most respectfully I have not objected to Mr. Hamilton's questions——

Senator SYMINGTON. I think it unfair to ask a man to testify, after he has said that he did not have enough money for various items, whether he is unhappy about it. I think it too abstract.

I think your question, in fairness to the witness, ought to be more concrete. I say that from the standpoint of the dignity of the Senate, and not in a partisan manner.

Senator SALTONSTALL. Mr. Chairman, I will take you at your word.

Senator SYMINGTON. I will abide by what Senator Duff says. If Senator Duff wants the witness to answer that question, I would be glad to have the witness answer it in the form it is in.

Senator DUFF. You are both my seniors and you can fight it out.

Senator SYMINGTON. I appreciate that, and am willing on that basis to stand by my protest. I think the question is of such an abseract nature that it boxes the witness to where it would be difficult for him to answer.

If I am wrong about it I stand corrected.

Senator SALTONSTALL. General, I have nothing more to say. I would appreciate any comment that you have to make after this little colloquy between the chairman and myself.

Senator SYMINGTON. General Putt, I would appreciate your comment in reply to what the distinguished Senator from Massachusetts, who is my senior and for whom I have great respect, has requested.

General PUTT. I think my comment would be that I would be troubled in even trying to answer whether I am unhappy or not because I don't know what unhappiness means in this context.

### SUMMARY STATEMENT ON AVAILABILITY OF FUNDS

But I think I would repeat my testimony that with the responsibility that I hold and the office that I hold, I do not honestly feel, and in my judgment do not think that there is sufficient dollars in the research and development appropriation P–600 funds, taking into account all of the funds that are available from all other sources, to carry out an effort that is going to keep us qualitatively ahead of the opposition.

Senator SALTONSTALL. Thank you, General.

I think that is a very fair statement in view of all your previous testimony.

Senator SYMINGTON. Senator Duff?

### SHORTAGE OF SCIENTIFIC AND TECHNICAL PERSONNEL

Senator DUFF. General, I would just like to ask you one question that has occurred to me which I have scribbled down here.

Recognizing the almost limitless horizons of scientific inquiry, if you had available all the funds requested for research and development, would you be limited in the use of these funds by the number of competent scientific personnel available?

General PUTT. I am hesitating a moment to make sure I give you a good answer. When you state, Mr. Senator, "the funds requested," are you thinking in terms of the present budget request, or in terms of the additional funds that I have indicated would be needed?

Senator DUFF. Yes, sir; I am thinking in terms of the totality which you desire.

General PUTT. Yesterday I indicated that I thought we needed somewhere in the order of $250 million additional in the P–600 funds. Now to answer your question with that as the basis of the funds requested or the amount of funds requested. I am sorry it is not a simple answer "Yes" or "No." However, as long as we have an expanding economy that is based as it is on technology, when one totals up the entire demand for scientific and technical personnel within the United States, compares it with the total supply of scientific and engineering personnel, I cannot help but admit that there is an overall shortage.

We would like to have more.

Senator DUFF. On that very point, one of the reasons that I asked that question was because I notice in almost every magazine, every newspaper every week, all scientific magazines, advertisements for scientists and engineers.

It is almost a new thing to see it in the continuation of those requests.

That prompted me to wonder whether or not one of the critical phases of this overall picture is not a shortage in that particular line.

### SKILL SHORTAGE WEIGHED IN FUNDS REQUESTS

General PUTT. There is an overall shortage, and this I have taken into account when I stated the amount of dollars that I thought we needed and could profitably use.

As I say, if you added up the total supply and demand, there will be a shortage. I doubt that the time will ever come when we will be able to satisfy our needs for the real top-level people; the idea men.

You can hire a lot of people and there are a lot of them available to do the drafting and the engineering once you have got the people that have the ideas, and they are the real cream.

Further, any individual concern will always be advertising, with want ads, in order to improve the quality of the personnel he has.

No matter how good it is he will always want to improve it.

Now if our research and development capacity within this country was not wrapped up in industrial packages as it is, then one could

draw the general conclusion that since there is an overall shortage of scientists and engineers, we cannot spend any more money in research and development.

But this is not the way it happens in practice.

We conducted an informal survey back here a few months ago. It is an order of magnitude things, I would not want to guarantee its accuracy but we wanted to get a feel for this very problem, so by sampling techniques we inquired of about 3 airframe manufacturers, 3 or 4 engine manufacturers, 2 or 3—correction—5 electronic manufacturers.

In order to get a representative sample, we picked some people that we thought were perhaps filled up wtih research and development work and therefore they either had a shortage or were really filled.

On the other hand, we knew of some whose workload was dropping off and they were around looking for work to just keep the people occupied that they had.

Our conclusion from this informal survey was that on an average that the contractors that the Air Force works with could absorb about 30 percent more work within their existing technical personnel capabilities.

Now, true, there were companies that it would have been foolish to add any more work because they would have been out hiring somebody else's engineers, but there were other companies on the other hand that if they did not receive more work, they were going to have to let engineers go.

So I don't think that it is correct, just because there is a total overall shortage, to say that more research and development work cannot be undertaken with good people and get a dollar's worth of research and development.

I think it is fine that all the scientific magazines are stressing the shortage of scientists and engineers, because as I mentioned yesterday, training scientists and engineers is a long lead time problem and an operation, unless we do something now about encouraging more people to become scientists and engineers, the overall shortage is going to get successively worse, and we will run up against a limitation where more work cannot be done.

### PERSONAL EXPERIENCE INCREASES INTEREST IN RESEARCH AND DEVELOPMENT

Senator DUFF. That is all. Thank you.

Senator SYMINGTON. General Putt, when did you enlist in the Air Force?

General PUTT. July 1928.

Senator SYMINGTON. You were in the first B–17, weren't you?

General PUTT. Yes, sir.

Senator SYMINGTON. It crashed on takeoff, didn't it?

General PUTT. Right, sir.

Senator SYMINGTON. In front of the Chief of Staff of the Army Air Corps, General Arnold, and everybody else. Is that right?

General PUTT. I don't recall General Arnold being there.

Senator SYMINGTON. Make your answers as short as you can and I will make my questions as short as I can, General Putt. Why did it crash?

General PUTT. Investigation showed the controls were locked on takeoff.

Senator SYMINGTON. Pilot error?

General PUTT. I think the investigation report indicated that.

Senator SYMINGTON. In other words, you have had practical experience in the importance of adequate money to insure good training to save lives.

General PUTT. That is right, sir.

Senator SYMINGTON. You walked away from the airplane.

Did everybody walk away?

General PUTT. No, sir. Two were killed.

Senator SYMINGTON. Were you the only survivor?

General PUTT. Three survivors.

Senator SYMINGTON. And two were killed?

General PUTT. Right.

Senator SYMINGTON. It is experiences like that, is it not, that make you anxious to see the proper research, proper development, proper maintenance, and the proper operation; is that right?

General PUTT. Very correct.

Senator SYMINGTON. Plus your interest in the security of your country?

General PUTT. Right, sir.

### RESEARCH AND DEVELOPMENT BUDGET FIGURES

Senator SYMINGTON. There have been a lot of figures given here this afternoon. Some I understood. Some I did not. I would like to go back if I may to some figures you testified to.

Eliminating budget change adjustments you referred to, and the maze of this whole budget performance of which I have been part, on both sides of the Government for many years, and which I do not yet completely understand, let me ask a few questions.

You testified, as I understand it, that you had $425 million in 1952; is that right?

General PUTT. Yes, sir.

Senator SYMINGTON. You testified, as I understand it, that you had $425 million in the fiscal year 1952 for research and development in the Air Force; is that correct?

General PUTT. Yes, sir. That was the appropriation by Congress.

Senator SYMINGTON. Let the record show that the Department of Defense budget figures as submitted against the figure of 425 million in 1952 was 429 million. And for the fiscal year 1954 you testified you had how much money for research and development?

General PUTT. 440 million was appropriated.

Senator SYMINGTON. Let the record show that the Defense Department budget figure is 513 million.

Now in 1955 you testified you had how much for research and development?

General PUTT. 418.070 million was appropriated.

Senator SYMINGTON. Let the record show the Department of Defense budget as presented to Congress shows 524 million.

In 1956 you had how much money?

General PUTT. On a comparable basis, 431 million.

Senator SYMINGTON. General, when you say comparable, do you mean at that point there was a major change in accounting method?

General PUTT. Right, sir.

Senator SYMINGTON. 431 million. Let the record show the figure given by the Department of Defense for research and development was 601 million.

I believe you went into some explanation of that, did you not, yesterday; namely, the nature of that budget change in accounting method?

General PUTT. Yes, sir, but it would not account for all of the difference that you have indicated there.

Senator SYMINGTON. What do you think would account for the rest?

General PUTT. Our number, taking into account the accounting change that I mentioned, would be 570 against your 601.

Senator SYMINGTON. Where would that 31 million be, the difference between 570 and 601?

General, unless you have that figure will you supply it for the record?

(The requested information is as follows:)

**The total P–600 research and development funds appropriated and transferred to the Air Force are indicated below:**

*Air Force R. and D. funds*

[Millions of dollars]

| Fiscal year | Appropriation | Emergency fund | Secretary of Defense transfer authority |
|---|---|---|---|
| 1952 | 425.0 | 24.1 | |
| 1953 | 525.0 | 8.0 | |
| 1954 | 440.0 | 1.7 | |
| 1955 | 418.070 | 2.3 | |
| 1956 | [1] 570.0 | 3.0 | [2] 19.5 |

[1] Includes $139 million indirect research and development support costs formerly included in other Air Force appropriations.
[2] Transferred from other Air Force appropriations.

Senator SYMINGTON. Now in fiscal year 1957, which we are up to now, the figure you gave us was 449; is that right?

General PUTT. Correct.

Senator SYMINGTON. And the budget figure was $625 million.

You may not know that. I submit it for the record, from the official budget.

General PUTT. I could account for $161 million difference. These are the indirect research and development costs formerly included in other Air Force appropriations but now in research and development at the direction of Congress. Those costs are not in the figures I gave you because I wanted comparable, and these costs are only in fiscal year 1956 research and development appropriations and fiscal year 1957 research and development budget.

Senator SYMINGTON. Of $449 million, it would be $161 million?

General PUTT. A total of $610 million.

Senator SYMINGTON. So there is only $15 million missing there.

Now, let's discuss the budget. I don't know much about it, but there has been a lot of discussion of it this afternoon, and I want to get myself straight.

You have in effect four major items, have you not, authorization, appropriation, obligation, and expenditure?

General PUTT. Right.

Senator SYMINGTON. Authorization may be nothing because it may not be appropriated; isn't that correct?

General PUTT. That is correct.

Senator SYMINGTON. Appropriations may be nothing because it may not be obligated, is that right?

It can be impounded, for example, as it often has?

General PUTT. It can be, yes, sir.

Senator SYMINGTON. Obligations can often mean nothing because contracts can be canceled; isn't that correct?

General PUTT. Contracts can be canceled.

### EXPENDITURES IMPORTANT

Senator SYMINGTON. So what really counts is expenditures; is that not true?

General PUTT. That is the measure of work accomplished.

Senator SYMINGTON. Thank you.

You are a lieutenant general in the Air Force of the United States; is that right?

General PUTT. Yes, sir.

Senator SYMINGTON. To whom do you report?

General PUTT. The Chief of Staff, General Twining.

### "SUPPORTING" THE BUDGET

Senator SYMINGTON. Suppose you went in to General Twining and said you refused to support the budget. How long do you think you would stay in the Air Force?

General PUTT. I think I would stay in.

Senator SYMINGTON. What do you think you would be doing?

General PUTT. I might have a new assignment.

Senator SYMINGTON. Do you think if you refused to support the budget it would affect your career?

I will withdraw the question.

Now I ask this question:

General Twining submitted a budget to the Secretary of the Air Force for $20 billion, and assured the budget was not padded.

General Twining is the Chief of Staff of the Air Force. He submitted a budget of some $20 billion to the Secretary of the Air Force and assured it was not padded.

The Secretary cut it $1,200 million. The Secretary of Defense cut that further to $16½ billion. But General Twining supported this reduced budget before the same committee from which Senator Saltonstall recently read some of your statements.

Senator SALTONSTALL. Will the Senator yield there?

Senator SYMINGTON. I will be glad to yield.

Senator SALTONSTALL. I think, General—I forget his name for the moment—will show and agree that out of that change and cut there was only $200 million of that cut that was an arbitrary cut. All the balance was gotten from using money from other sources which were beyond General Twining when he submitted the figures.

Senator SYMINGTON. I heard all about that testimony. That is before another committee, by another general. This witness is not a fiscal expert. The above figures were given me by the Secretary of Defense—letters from the Secretary of the Air Force and the Secretary of Defense. Those letters said that the Chief of Staff of the Air Force recommended $20 billion to the Secretary of the Air Force, and the Secretary of the Air Force himself cut that to $18.8 billion, and then it was cut further to $16.5 billion. But before the same committee, referred to by the Senator from Massachusetts, the Chief of Staff of the Air Force stated recently he would support that budget.

Do you believe General Twining was telling the truth when he said that in his opinion the Air Force needed $20 billion to function properly, and that he had not padded the budget?

General PUTT. I think that that was his judgment as to what was required.

Senator SYMINGTON. As Chief of Staff of the Air Force, if the Commander in Chief and the Secretary of Defense state, "This is the budget"—I repeat that—if the Commander in Chief and the Secretary of Defense say, "This is the budget and I expect everybody to supoprt it," the only thing the Chief of Staff of the Air Force can do is support said budget or resign. Is that right, based on the theory of the chain of command?

Let me put it to you this way.

Do you know of anybody who ever refused to support the budget and did not resign, in your military career?

General PUTT. I do not recall of anyone offhand.

Senator SYMINGTON. I don't recall anyone either. Now as long as the same type and character of questions are being asked here with respect to your support of the budget, before the committee, as I have heard asked before the full Senate Armed Services Committee, and as long as your testimony before the House committee has been quoted against your testimony here this afternoon——

Senator SALTONSTALL. Oh, now, Mr. Chairman, that was not done.

Senator SYMINGTON. I beg your pardon. My understanding is General Putt said in many cases he did not have enough money. In his statement you read, I thought you read something that implied he was satisfied.

Senator SALTONSTALL. Oh, no; I did not say that at all. I prefaced my question by saying that the general was consistent, and then I read what he said, and I will read it again if you want.

Senator SYMINGTON. I will be glad to have you read it again.

Your stating the general was consistent is not correct, as I understand it, Senator.

Over a period of hours the witness has testified he felt not enough money was being given the Air Force on various items from the standpoint of "optimum." I believe that was the word he used.

He felt there should be more funds.

Senator SALTONSTALL. That is right.

Senator SYMINGTON. My impression of the statement you read from the previous hearing was that the record showed he approved the budget. I believe it a matter of fairness and commonsense that nobody backs anything he does not think right.

Senator SALTONSTALL. Mr. Chairman, most respectfully I would read, with your permission, I will read the words of General Putt in answer to a question which I think I read to him.

Senator SYMINGTON. You read one by Mr. Deane, didn't you?

Would you read the one you read before?

Senator SALTONSTALL. I read this one first.

General Putt, if this is not right, tell me if it is not right.

General Putt in answer to Mr. Mahon:

We rather constantly review our requirements, and we feel we could profitably effectively use some more funds in some very important work. We are not asking for more money at this point, but we feel we could use more money profitably.

Isn't that the statement I read to you?

General PUTT. That is the statement you read to me, yes, sir.

Senator SALTONSTALL. And I prefaced it by saying that you were consistent here with what you said there.

Then I also read the statement in answer to Mr. Deane:

General PUTT. That is correct. I have great respect for our Secretary, also, and accept his judgment and, therefore, support this budget we are asking for.

I read you those two statements.

### SUPPORT OF INADEQUATE BUDGET

Senator SYMINGTON. I think you confirm my position 100 percent. In the chain of command it is essential for this officer to support the budget of the Secretary of Defense even though it is obvious that his testimony shows he does not believe the budget is adequate.

Senator SALTONSTALL. That is correct.

Senator SYMINGTON. We are clear on that.

The representatives of the other services are here. It is my understanding that under the American system you not only have the right, but the duty to tell the Congress, responsible for supporting and maintaining our armies, navies, and air forces, what you believe, your best opinion as a military man.

In addition, and in order to protect all witnesses before this committee, it was decided that this time all witnesses would be sworn.

Senator Jackson, I know you are very busy and you left another hearing. I have further questions, but if your time is short I would be glad, if the committee approves, to yield to you at this time.

Senator JACKSON. I just want to ask a couple of questions if it is not out of order.

I am sorry I am late.

General, how much did you ask for in fiscal 1956? For research and development?

General PUTT. P–600 funds.

### RESEARCH AND DEVELOPMENT BUDGET CEILINGS

Senator JACKSON. How much you asked for—I suppose your request goes to the Chief of Staff—how much out of your department did you ask for for research and development?

General PUTT. In 1956 we asked for the ceiling as given by the guide lines.

Senator JACKSON. Now wait a minute, which comes first, the chicken or the egg? You were given a ceiling?

General PUTT. Right.

Senator JACKSON. So you were in other words told what you could ask for.

What would be the figure to carry out your mission, knowing that the main advantage our air strength, whatever it is, is no longer the quantitative advantage?

LOSS OF QUANTITATIVE RACE TO SOVIETS

We lost the quantitative advantage long ago; is that right? There is no question about it?

General PUTT. That has been given in testimony.

Senator SYMINGTON. General, be sure that you answer the question orally so that the reporter can get your answer.

Senator JACKSON. We have long since lost the quantitative race at least as far as jet aircraft are concerned with the Soviets?

General PUTT. Quantitative?

Senator JACKSON. Quantitative.

General PUTT. The record will show that.

Senator JACKSON. That has been testified to.

General White has made a speech which I can almost quote verbatim; he has said they have long since passed quantitatively and are closing the gap qualitatively; is that right?

General PUTT. That is his statement.

Senator JACKSON. The reason I am asking you about this statement, is that you are in charge of the qualitative department in the sense that all advances have to incubate some place and you are in the incubation field.

General PUTT. Right.

BUDGET IN RELATIONSHIP TO QUALITATIVE POSITION

Senator JACKSON. So if we are going to have a qualitative advantage, it develops from your department?

General PUTT. Yes, sir.

Senator JACKSON. Therefore, I would like to find out from you now, in order to maintain the kind of qualitative position that we should have to overcome the obvious quantitative advantage of the Soviets, what money in your judgment, without guidelines at all but relying now on your best professional judgment as a military man, how much money should you have had for fiscal 1956?

General PUTT. Should we have had for 1956?

Senator JACKSON. Right; should you have requested for fiscal 1956. We will apply these same questions for all the years.

General PUTT. In a special letter to OSD, we requested an additional $126 million for 1956.

Senator JACKSON. Do you know when you requested that, about when?

General PUTT. It is about September 24, 1954.

Senator JACKSON. That was for fiscal year 1956?

General PUTT. 1956.

Senator JACKSON. You had asked for $126 million in addition to what figure?

General PUTT. Over the ceiling of——

Senator JACKSON. That they granted you?

General PUTT. That they granted us, $126 million over and above a figure of $431 million, which was the ceiling specified in the guidelines.

Senator JACKSON. That is $557 million total?

General PUTT. That is $557 million total; yes.

Now to be consistent with other figures that you have heard, an additional $139 million must be added to that due to the bookkeeping change in fiscal year 1956.

Senator JACKSON. So it would be $696 million?

General PUTT. That is correct.

Senator JACKSON. What figure were you able to retrieve after you got out of the Bureau of the Budget?

That is the last jumping-off place before you come up here, the Department of Defense and Bureau of the Budget.

Give me figures first for the Department of Defense and then the Bureau of the Budget. They have some experts in the Bureau of the Budget.

General PUTT. $592.5 million.

Senator JACKSON. Is what you got out of Defense?

General PUTT. That is the total of our appropriated funds, $570 million plus what we got out of the emergency fund, $3 million plus $19.5 million transferred from other Air Force appropriations by the Secretary of Defense.

I don't believe I see the distinction between the Department of Defense and the Bureau of the Budget because all of the money comes to the Department of Defense through the Bureau of the Budget.

Senator SYMINGTON. Will the Senator yield?

That is my fault. I take responsibility for his having asked that.

You do not know how the money was cut up between the two departments, is that right?

In other words, in the final figure you get, you would not know of consultation between the Bureau of the Budget and the Department of Defense?

General PUTT. That is correct.

Senator JACKSON. The Bureau of the Budget could have cut the Department of Defense recommendation.

Senator SYMINGTON. That is right.

I felt the general might not know that.

Senator JACKSON. That was true for fiscal 1956?

General PUTT. That is right.

Senator JACKSON. Could you supply the figures using the same question, in order to avoid a lot of verbiage in the record here, applied to fiscal 1954, 1955, and 1957?

General PUTT. I am afraid I would have to supply that for the record for 1954 and 1955.

Senator JACKSON. All right; supply that for the record, but if you can give it now on fiscal 1957.

Senator DUFF. Senator Jackson, would you yield for a suggestion at this point?

Senator JACKSON. Certainly.

Senator DUFF. I suggest for the record that, in order to clarify this picture and enable everybody on the committee to get a clear

idea, that we call General Bogart so that we have it officially from that source as to the figures because, I do not know how it is with you gentlemen, I am getting very confused at this overall picture.

Senator SYMINGTON. Will the Senator yield?

Senator JACKSON. Certainly.

Senator SYMINGTON. We will have anybody you want. I know that we talked about three different figures today. In order that we can clarify the situation based on the previous testimony, I read you the figures for the years that he mentioned, 1955, 1956, and 1957; is that correct?

Senator JACKSON. 1954, 1955, 1956, 1957.

Senator SYMINGTON. 1954, 1955, 1956, and 1957.

### PROFESSIONAL JUDGMENT VERSUS BUDGET DECISIONS

Senator JACKSON. But you see my first question goes to what in the general's opinion is his best professional military judgment on what the research and development funds should be.

Those figures stem from a controlled recommendation to start with. You are told how much you can ask for.

Obviously that cannot be your best professional judgment because you are not exercising your professional judgment.

You are exercising your discretion on a limited basis pursuant to a directive.

General PUTT. Have I satisfactorily answered the Senator on 1956?

Senator JACKSON. I understand that your best judgment was that you should have had $696 million; that instead you got $492 million from all sources.

General PUTT. Correct. To be accurate, could I modify that figure?

Senator JACKSON. Yes; you can change the record later.

General PUTT. I would like to add $3.7 million to that figure of $126 million. And the date of this request was December 5, 1955, when Secretary Quarles advised the Secretary of Defense that we needed $129.7 million more in fiscal year 1956 because of additional requirements as a result of the Killian report.

Senator JACKSON. You mean for the additional funds for the current fiscal year?

General PUTT. For fiscal year 1956.

Senator JACKSON. But that was a supplemental item to apply on the current expenditures?

General PUTT. Yes; and represents pretty well what I think would have been required in 1956 to carry out a good program.

Now for 1957?

Senator JACKSON. Yes.

General PUTT. I would have as of December 5, 1955, and did indicate that additional $222,684,000 would be required in the 600 series funds over and above the $610 million due to Killian committee recommendations.

Senator JACKSON. That was approved?

General PUTT. The $610 million was approved but not the additional $222 million for Killian items.

Senator JACKSON. You came up to Congress for $610 million?

General PUTT. Yes, sir.

Senator JACKSON. In other words, it is your best professional judgment that you are $222 million short of what you feel research and development should have to carry out its assigned mission, for fiscal 1957.

General PUTT. For fiscal 1957, and this was the best judgment on December 5 of additional funds required for Killian report items.

I have testified to the committee that since then we have had additional reviews of our program, and I have increased that figure from somewhere between 200 to 300 million, average, round it off at 250 million, which is slightly in excess of the 222 that was indicated on December 5.

Senator JACKSON. Now then for the other years you will supply that for the record?

General PUTT. Yes.

(The requested information has been supplied in classified form.)

Senator JACKSON. Again in response to the same questions, it is not the control figure that I want, I want your own honest intellectual judgment.

Isn't it a fact that after the decision was made back in August to give the ICBM an overriding priority, within the Defense Department, and the entire executive branch, a subsequent, similar and concurrent priority was given to the IRBM 1 and the IRBM 2 that proceeded to dissipate the funds in research and development and take away automatically funds from other important assignments within our research and development of the Air Force, without any subsequent addition to your research and development fund?

General PUTT. You are referring now to just P–600 funds for research and development?

Senator JACKSON. I don't know what P–600 means.

General PUTT. I am sorry.

Senator JACKSON. I know what the first letter means.

General PUTT. Within the budget structure those funds which are appropriated and labeled for research and development are known as the P–600 funds. We refer to them as P–600, and as has been brought out by the committee, of course there are other funds that contribute to and support the total research and development job.

### LONG-RANGE BALLISTIC MISSILE PRIORITY

Senator JACKSON. My point is—I am not so much concerned about the fine details, but the net effect of the decision on the overriding priority, and much point was made of this, that no more funds were neded for the ICBM and the IRBM 1 and 2—whether there is a 3, I don't know how many—there were no additional funds needed because there were adequate funds available within the Department of the Air Force, at least in that category, to carry on the work.

I did a little checking on that myself some time ago. My recollection was that certainly there was no need at the time because the ballistic-missile program had an overriding priority which automatically took the money out of these other categories, and it was affecting other important research and development funds because those funds were not being replaced by reason of the action that occurred with that priority.

Don't misunderstand me, General. I was the one who recommended this priority in the first place to the President so I am not here objecting to it.

The only thing I objected to is that they added on a lot of other priorities.

Senator SYMINGTON. Do you understand the Senator's question?

General PUTT. I understand.

Mr. HAMILTON. He is including any funds from research and development from whatever source that were used in the development of the ICBM.

General PUTT. To keep it clear I will answer this a piece at a time.

First as to the effect on just the P–600 fund, those that are labeled research and development. We went into the fiscal year with $20 million programed for the ICBM.

Senator JACKSON. And the IRBM?

General PUTT. No, just ICBM. I will handle ICBM and IRBM separately.

Senator JACKSON. Are we talking about fiscal 1956?

General PUTT. 1956, right.

Senator JACKSON. That is what I want now.

General PUTT. Right.

Senator JACKSON. You had that much earmarked and along comes this overriding priority.

Let's find out what it did to the rest of your fund.

General PUTT. Just within the P–600, research and development funds, we went in with $20 million.

The overriding priority came along. There were no more P–600 funds added, so we came out of the year with $20 million, so there was no effect in P–600 funds.

On the IRBM, we had programed no dollars in 1956 for the IRBM. The priority came along, and we now have $4 million on the IRBM out of project 600 funds.

Those $4 million came from the transferability authority that the Secretary of Defense had from other funds, and the $4 million came from some other Air Force account.

I do not know which account it came from, but it did not come out of the research and development funds, the P–600 project.

Now obviously $4 million was not all the dollars we devoted to both of those programs in 1956.

Senator JACKSON. It is about 180 million.

General PUTT. Roughly 466 million.

Senator JACKSON. General, if you wish you can supply these for the record. What I am trying to get at, I think you understand, is the impact of this priority, which was an important priority and I think a sound one; I am not questioning that. But what I want to find out is the impact of that priority on other funds within research and development under your jurisdiction, and this is outside of your jurisdiction.

General, if you could get it, it is impact on the funds in other categories of the Air Force?

General PUTT. The reason, Mr. Senator, I am unable to answer your question, is that it is outside of my function to keep track of funds other than the 600 so I don't know what they had in the program in the beginning of the year in support of this, and how much went into it at the end of the year.

Senator JACKSON. Maybe you and General Musgrave can work that out and supply it for the record.

You do not need to do it now, but I do think it is important in order to get the complete picture here.

General PUTT. Correct.

(The requested information has been supplied in classified form.)

Senator JACKSON. Now I have just one last question.

I take it that we are relying on our qualitative capability to overcome the quantitative advantage of the Soviets?

General PUTT. Right, sir.

Senator JACKSON. In your judgment, with the funds that you have received and are currently receiving, can we maintain that position of qualitative superiority?

EFFECT OF CURRENT FINANCIAL POLICIES

General PUTT. It is my judgment that if the trends continue, we cannot.

Senator JACKSON. It is your judgment that if the trend—by that I take it you mean the appropriation trend, the money that is available to you to carry out your mission—if it continues on the same basis it has in the past several years, if it continues along that same trend in the future, that we will lose our qualitative capability of overcoming the quantitative advantage of the Soviet in the field of air power?

General PUTT. That is my judgment.

Senator JACKSON. You are my professional adviser here. I am a layman. I do not know anything about this.

But I hear the statement made constantly, General. That is why I wanted to ask you the question.

Years ago we were told of course that we have both quantitative and qualitative advantage.

General PUTT. Yes, sir; right.

Senator JACKSON. Now we have to concede that we have lost the quantitative race so the only other argument you come back with is the qualitative one.

General PUTT. Right, sir.

MORE FUNDS NECESSARY

Senator JACKSON. In other words, if we are going to maintain or to have air superiority in the future, and that is premised on taking into consideration the quantitative and the qualitative problem, we have to make a substantial change in the funds that are being made available in research and development and other categories that will make possible in the future qualitative advantage of a size and nature that can overcome the quantitative advantage that the Soviets now have in air power?

General PUTT. I believe that we must.

Senator JACKSON. I think, Mr. Chairman, that it would be helpful if General Putt would submit for the record what is his best professional judgment of what we need for fiscal 1958 and 1959, and that is not looking ahead too far because you have a time factor here in the development sense as regards what we need in the way of funds.

Senator SYMINGTON. Without objection, it is so requested.

Senator JACKSON. And break down the areas of research, fields of research.

Senator SYMINGTON. Will you see that that is submitted for the record?

General PUTT. I will, sir.

(The requested information has been supplied in classified form.)

ATOMIC PLANE IMPORTANT

Senator SYMINGTON. General Putt, do you believe that the atomic plane is important?

General PUTT. Yes, sir.

Senator SYMINGTON. Do you believe it is very important?

General PUTT. Yes, sir.

Senator SYMINGTON. Are you making progress on it?

General PUTT. Yes, sir.

Senator SYMINGTON. The idea was given that if you really got excited about something, you could get the money for it?

General PUTT. That I would try to get the money for it.

Senator SYMINGTON. You would try to get the money for it?

General PUTT. Right, sir.

Senator SYMINGTON. Have you been excited about the atomic plane for some time?

General PUTT. Yes, sir.

Senator SYMINGTON. How many years?

General PUTT. 1946–47, in that period of time.

ATOMIC PLANE UNIMPORTANT

Senator SYMINGTON. I won't ask you a question on this but I want to read into the record some testimony in the spring of 1953:

Senator FERGUSON. Then you certainly feel this research is a very vital and important item, and that the development part of the research is very vital and that we are progressing and should progress into the future with new planes, new kinds of planes, new weapons, and even going to guided missiles and all of the other things that will give America and the free world a strong defense; is that correct?

Secretary WILSON. That is right; but I think it should be supervised and guided a bit, so it is in what I call a fruitful research area. If we want to go ahead and have pure research, let us let somebody subsidize it. Let us not put the burden of it on the Defense Department. I am not much interested, as a military project, in why potatoes turn brown when they are fried.

Senator MAYBANK. Did they have such a project as that?

Secretary WILSON. That is an apt way to describe it.

Senator MAYBANK. I have to differ with you.

Senator FERGUSON. All right, Mr. Kyes, you had something on this research and development.

Senator HILL. Mr. Wilson, why not give us a real or true illustration, not about potatoes, but something you did not approve of.

Secretary WILSON. We were pushing the atomic airplane. You could consider that was in the area of pure research. We were pushing that too fast, because if everything worked out perfectly like the scientists hoped it would, it still would have been a bum airplane.

Senator SYMINGTON. I submit that for the record and do not ask you to comment on it.

Senator JACKSON. Would you yield for a question?

Senator SYMINGTON. I will be glad to yield.

Senator JACKSON. Isn't it a fact—I have had quite an interest in the atomic airplane for a long time, some of us over on the joint

committee have been pushing it for years—isn't it a fact that the funds were cut back quite a bit on the atomic airplane?

It is only in the last year and a half or 2 years, the last year to my knowledge that it has been given any real push at all, General.

General PUTT. That is correct.

Senator JACKSON. And it was sort of poohpoohed for quite a while?

General PUTT. That is correct.

ATOMIC PLANE FUNDS CUT

Senator JACKSON. And the Air Force did request a substantial sum of money as I recall from 1953 to 1954 and it was cut out in the Defense Department?

General PUTT. That is right. It was cut out of the fiscal year 1954 research and development program.

The Killian committee report, which we have referred to before, laid considerable stress——of course that is a more recent date than 1953—the nuclear aircraft.

I should like to indicate though that whereas in 1957 our research and development command indicated a requirement for research and development funds of 112 million for the A. N. P. program——

Senator SYMINGTON. What is A. N. P.?

General PUTT. Aircraft nuclear propulsion. We have now programed $20 million.

Senator JACKSON. Yes, but would you supply for the record what you asked for, starting back in 1953–54, and what you got for all of those years up to date?

General PUTT. Right, sir.

Senator SYMINGTON. You say you asked for $120 million and got $20 million?

Senator JACKSON. What year is that?

General PUTT. 1957, the year coming up, you see.

Senator SYMINGTON. For fiscal year 1957?

General PUTT. For fiscal year of 1957.

Senator SYMINGTON. You asked for $120 million and you have been apportioned $20 million?

General PUTT. Not quite, Mr. Chairman.

Senator SYMINGTON. Let's get it clear for the record.

EFFECTS OF R. AND D. MONEY CEILING

General PUTT. The 112 million was the stated requirement to carry on the work in the aircraft nuclear propulsion program.

Now within the 610 million ceiling that has been placed on the——

Senator JACKSON. Overall?

General PUTT. Overall research and develpment appropriation for 1957 in our financial plan of how we should allocate that $610 million, we have programed $20 million against the aircraft nuclear propulsion program.

Senator JACKSON. So that you had to lop off a big chunk of your overall research and development funds in order to even get the 20 million?

General PUTT. Correct. Other things dropped out of the program, but we attempt to allocate the funds that are made available on a priority basis among all of the projects.

Senator SYMINGTON. If the Senator will yield, that is what Senator Jackson was trying to get at some time back. You had to drop or sharply reduce other programs because of the limited money available in order to handle the highest priority programs; is that right?

General PUTT. That is right.

Senator SYMINGTON. Thank you.

### MILITARY IMPORTANCE OF NUCLEAR PLANE

Senator JACKSON. What is the view, the official view of the Air Force, I am talking about the professional military people in the Air Force, other than the scientists, their view as to the importance of a nuclear-powered aircraft to carry out the assigned mission of the Air Force?

General PUTT. I think I am stating it correctly when I say it is the view of all the military folks in the Air Force who are familiar with the problem that it is very important. We should get it as soon as we can.

Senator JACKSON. It would have a tremendous impact upon the assigned mission, for example, of the Strategic Air Command; isn't that correct?

General PUTT. That is correct.

Senator JACKSON. And as a matter of fact an impact on all the areas within the Air Force?

General PUTT. That is right.

Senator JACKSON. Mr. Chairman, I think that this is an example, and I have watched this thing for years, of what happens when research and development lags, because the truth is the Air Force has been held back over a long period of time in getting funds for this program.

I think it would be interesting to have in the record what the Navy received for the reactor for the submarine.

Senator SYMINGTON. And the Army for anything that it considers essential.

I thank the Senator and would like the record to show that in addition to being a valuable member of this committee and the Senate Armed Services Committee, Senator Jackson speaks from his experience as chairman of the Subcommittee on Military Applications of the Joint Atomic Energy Committee.

### CANCELLATION OF FIGHTER PLANE CONTRACTS

General Putt, here is an article dated May 16, by a responsible reporter and an able reporter, which says:

> The Air Force said last night it had canceled contracts for the development of 2 new 1,400-mile-an-hour fighter planes.

Is that true?

General PUTT. Yes, sir. Two contracts were canceled. ⓓ

Senator SYMINGTON (reading):

> The spokesman confirmed that orders placed last August for the design of a long-range interceptor and a fighter bomber have been rescinded.

Is that true?

General PUTT. Yes, sir.

Senator SYMINGTON (reading):

Lack of research funds was reported responsible but the spokesman said only "We are putting our research and developments efforts on other projects."

I will put it this way:

Would this be an illustration of the point that was just being made by Senator Jackson of transferring funds to higher priority items?

General PUTT. It is a partial illustration of that.

Senator SYMINGTON. I read into the record in the same article this statement, without requesting you to comment:

The Defense Secretary was asked about cancellation of the plane research contracts prior to their confirmation by the Air Force. He said he had not heard of it and "would doubt" that it had been forced by a shortage of research funds.

At this point the Chair observes that press conferences and comments being made with respect to these hearings, at various levels, in his opinion create more heat than light.

An article this morning, May 17, says:

Senators inquiring about the cancellation of the development plans for two new Air Force fighters heard testimony from the Defense Department's research chiefs yesterday about a mystery plane of "even higher performance being in the works." The mystery deepened later in the day when Air Force officials said they did not know what Assistant Defense Secretary for Research and Development, Clifford C. Furnas, was talking about.

Do you know what he was talking about?

General PUTT. Yes, sir.

Senator SYMINGTON. Will you tell the committee what he was talking about.

General PUTT. What he had in mind, I believe, was the XF–103. (D)

The inference in the press report there is that this was a fighter in the same class as those which were terminated.

I am sure——

Senator SYMINGTON. What were the numbers of the two that were terminated?

General PUTT. They had not yet received any model numbers.

Senator SYMINGTON. Then the work on the XF–103 had started before the work on the other two, hadn't it?

General PUTT. It had started in 1951.

I must point out that the F–103 is an airplane which would not fulfill the mission of the two that were terminated.

Senator SYMINGTON. I understand that.

Now you have got the F–105, is that right?

General PUTT. That is a fighter-bomber.

Senator SYMINGTON. Right, and that is being made. Was that designated or was that put into design after the XF–103 or before?

General PUTT. The 105 came in after the 103 work was started.

Senator Symington. I understand your point, that the statement made by the Department of Defense with respect to the F–103—which you state is the plane they were referring to—was reference to a plane that had nothing to do with the mission of the two planes canceled.

My further question in this regard, which I am only asking for information, is, which plane was started first?

Let me put it this way: Were the planes that were canceled started before the XF–103; or was the XF–103 started before the two planes that were canceled?

General PUTT. The XF–103 was started before the two that were canceled.

MISLEADING INFORMATION

Senator SYMINGTON. Then if the implied thought here was that they were putting in an even better plane in order to balance the canceling of the other two, if that was the implication, that implication is not true. Is that right?

General PUTT. That is correct.

Senator SYMINGTON. That is what I was getting at.

Senator JACKSON. What were the funds to be used for after they canceled these two items, the unnumbered items?

General PUTT. When we canceled them there were little or no funds left on the project.

Senator JACKSON. That is the reason why they were canceled. To take those funds to improve or do research and development on a plane that was going to be better than the two mentioned in the news item?

General PUTT. There will be little or no funds retrieved from the termination of those two projects.

Senator JACKSON. But even if there were any funds retrieved from the termination of those two projects, they are not being earmarked for any new plane that was to be better than the ones mentioned in this article, is that right?

General PUTT. That is right.

Senator JACKSON. The story is completely misleading.

CANCELLATION DUE TO LACK OF FUNDS

Senator SYMINGTON. How does it happen that competition for this long-range interceptor was canceled? Was it lack of funds?

General PUTT. In 1957 within the ceiling budget our financial plan shows no funds available to continue the project.

Senator JACKSON. In your professional judgment is this an important project?

General PUTT. Yes, sir.

Senator JACKSON. Is it necessary?

General PUTT. Yes, sir.

Senator SYMINGTON. Who made the decision not to go ahead with it?

Senator JACKSON. The man that controls the dollars.

Senator SYMINGTON. It is in the paper. If they are going to put such detail in the press, they might as well tell the Congress about it, too.

General PUTT. I took the action. Falling within my area of responsibility, having to manage the research and development program, if I had no resources to carry on the program the following year I had to take some action.

Senator SYMINGTON. In other words, General, to lay it right on the line, an item of development you think essential to the security of the United States you have been forced to cancel because of lack of funds; is that right?

General PUTT. Yes; with one qualification.

Senator SYMINGTON. Please qualify the question in any way you would like.

General PUTT. There was one other consideration.

This was a project of the nature that we talked about before where we had been carrying two contractors along in competition during what we call the phase 1 which——

Senator SYMINGTON. Like the B–45 and the B–47?

General PUTT. That is right. It was rather apparent that the direction in which the development was going, in order to meet the requirements that we had laid down for this airplane, was going to result in an airplane that was considerably larger, heavier, and more costly than we would like to have had.

Senator SYMINGTON. Are you talking about both airplanes that were canceled?

General PUTT. Both airplanes. So this was a consideration along with the fact that there were not sufficient funds to carry it on.

Senator SYMINGTON. If you had sufficient funds do you believe it was in the interests of the country to continue the development?

General PUTT. We would have continued one of them and would have attempted to modify the design to what more nearly would appear as an attractive airplane.

### REPLACEMENT FOR B–52

Senator SYMINGTON. What are you doing for a replacement for the B–52?

General PUTT. We have only some research and development projects at this time.

Senator SYMINGTON. The B–58 is not to be a replacement for the B–52, is it?

General PUTT. No. (D)

Senator SYMINGTON. Are you getting enough funds to handle the replacements of the B–52, from the research and development standpoint, the way you think they should be handled, from the standpoint of the security of the United States?

General PUTT. Not for next year, we will not have sufficient funds.

Senator SYMINGTON. Considerably less than half of what you need for one of the most promising programs, is that right?

General PUTT. That is right. (D)

### NUCLEAR PLANE

Senator SYMINGTON. How about the nuclear plane, what are the figures on that?

General PUTT. Those were the ones that I quoted before, an indicated requirement of $112 million. We have programed $20 million.

Senator SYMINGTON. So in that case you got about one-sixth of what you felt was essential. Is that right?

General PUTT. Roughly.

### POSSIBLE LOSS OF QUALITY LEAD ALSO

Senator SYMINGTON. And these are the type and character of operations which make you reply to Senator Jackson that in your opinion if this goes on we have already lost the quantity lead and if this type and character of programing goes on we will lose the quality lead, also, is that right?

General PUTT. That is correct.

Senator SYMINGTON. Thank you.

Senator JACKSON. Returning a moment to the program which you told the chairman was being funded for considerably less than half what you need, when could you get into operation if adequate funds were made available?

General PUTT. It would still take quite a few years. I will also give you our best estimate on it in classified form. (D)

SOVIET DEVELOPMENTS CAUSE OBSOLESCENCE

Senator JACKSON. So that they can't very well argue then that it is a bad thing to turn out a lot of B–52's because they are going to become very obsolescent. We are not going to make the B–52 obsolescent, are we, General, the United States?

General PUTT. No, sir; we won't make it.

Senator JACKSON. The Soviets may. That is the real danger.

General PUTT. That's correct. (D)

Senator SYMINGTON. I make this comment here. I have made it before, and I make it again for the record.

We used to say as children that, if we had some ham, we would have some ham and eggs, if we had some eggs. We are now doing that in reverse. We are saying that because we haven't got the people, we had better cut the bases and the planes. We say then that because we haven't got the bases, we had better cut the planes and people. Then because we haven't got the planes, we had better cut the people and the bases. Always we lower the two higher components instead of raising the lowest one to the other two.

So each year we see the record come true as based upon the prophesy of the late great General Vandenberg. That is the trick so far as the method of reducing the budget is concerned.

General, do you agree with me on that?

General PUTT. It appears at times to operate that way; yes.

Senator JACKSON. Give the general the right to revise his remarks.

RATE OF INCREASE

Senator SALTONSTALL. General, do you agree with me that this year they are building more B–52's and they are building more bases? Do you agree with that statement?

General PUTT. More are being added to the program this year.

Senator SALTONSTALL. So that is putting 1 egg on top of the ham, and by golly, next year we will get 2 eggs on top of 2 big pieces of ham.

Senator SYMINGTON. Will you also agree that in the year 1955, we purchased—purchased, not delivered—less than one-fourth as many combat planes as we did in the year 1952?

General PUTT. I don't remember the figures.

Senator SYMINGTON. Will you submit for the record whether or not that is a fact?

General PUTT. Yes, sir.

(The information requested has been supplied in classified form.)

Senator SYMINGTON. I would like to pay this compliment to Senator Jackson. Much of the reason why the Department of Defense

finally raised the B–52 production from 13 to 17 was because of his apprehension about our future security. Much of the reason why they finally raised it from 17 to 20 was also because of the same apprehension. I only wish that there was some other way of further impressing the administration with the importance, based on the testimony you have just given, of the nuclear plane.

Have you ever figured how many years, based on present schedules, it would take to get the number of B–52's now desired?

General PUTT. I haven't personally calculated that.

Senator SYMINGTON. Will you do that for the committee, the present rate of production and the present number of B–52's that are ordered, how many years it would take to get the number that is desired.

General PUTT. Whose figure as to what is required?

Senator SYMINGTON. I am glad you asked that. I think it would be fair to use General LeMay's figure.

(The information requested has been supplied in classified form.)

TREVOR GARDNER ARTICLE

Senator SYMINGTON. Did you know Mr. Trevor Gardner, the Assistant Secretary of the Air Force, when you were in the Air Force?

General PUTT. I did.

Senator SYMINGTON. What was your title when Mr. Gardner was in the Air Force?

General PUTT. The same as now, Deputy Chief of Staff, Development.

Senator SYMINGTON. And what was his title?

General PUTT. Initially he was Assistant to the Secretary for Research and Development, and later appointed Assistant Secretary of the Air Force for Research and Development.

Senator SYMINGTON. He wrote an article, General. I would like to read some of this article to you, and ask you to comment on it.

Mr. Gardner says:

The intercontinental ballistic missile is probably the greatest single advance in weapons that will be obtained by any country in the next 10 years.

Do you agree to that?

General PUTT. Yes, sir.

Senator SYMINGTON (reading):

The nation that gets it first may be in a position to determine the kind of world we will live in for the next generation. We and the Russians are racing forward, but our own effort is snarled up in bureaucratic redtape.

Do you agree to that? Counsel says I asked a lot of question at one time.

General PUTT. That is correct.

Senator SYMINGTON. I thank the counsel. Now I ask this question. Mr. Gardner says:

But our own effort is snarled up in bureaucratic redtape.

Do you agree to that?

EXCESS OF REDTAPE

General PUTT. It is my judgment that there is more than is necessary.

Senator SYMINGTON. More what?

General PUTT. Redtape.

Senator SYMINGTON. Former Secretary Gardner says:

The overall missiles program is smothering in an administrative nightmare of committees and subcommittees competing with each other for influence and appropriations.

Do you agree to that?

General PUTT. I would not use those descriptive adjectives.

Senator SYMINGTON. Let me read his assertion slowly. Then you consider what your answer would be. Take all the time you want.

Mr. Gardner says:

The overall missiles program is smothering in an administrative nightmare of committees and subcommittees competing with each other for influence and appropriations.

I think it is in order at this time to bring up the point I made with General Putt after the hearing yesterday. I said I intended to ask him questions against this Gardner article. That is correct, isn't it, General?

General PUTT. That is correct.

Senator SYMINGTON. Let me read Mr. Gardner's statement again. Then you phrase it any way you like:

The overall missiles program is smothering in an administrative nightmare of committees and subcommittees competing with each other for influence and appropriations.

MULTIPLICITY OF COMMITTEES

General PUTT. There are a multiplicity of committees that are involved in carrying out the missile-research and development program. There cannot help but be competition for the dollars that are available.

I think this competition goes on between all projects, between the various services, for the dollars, not exclusively in the missile field, but with respect to all projects.

Senator SYMINGTON. Mr. Gardner continues:

The intercontinental ballistic missile project which 2½ years ago was given a top priority status now shares top priority with many subsidiary missiles projects, and the result there is no such thing as top priority.

Do you agree with that?

General PUTT. There is more than one top priority project.

Senator SYMINGTON. Well, then the statement is correct, isn't it? If there is more than one top priority, there is no top priority. Is that correct?

General PUTT. Correct.

Senator SYMINGTON. Thank you. Mr. Gardner continues:

The executive personnel of the missiles program is notable for its preponderance of management experts recruited from private business, and for its poverty of full-time scientists who qualify as missile experts and know what they are talking about.

Do you agree with that?

General PUTT. As to the source of the people that are on committees and whatnot, that is correct.

MORE SCIENTISTS NEEDED

Senator SYMINGTON. Let me put it to you this way. Without criticizing anybody, is there a serious shortage of scientists all through the missile program?

General PUTT. It could use more.

Senator SYMINGTON. Mr. Gardner says:

> The people who, after all, are the ones most deeply concerned, remain the least informed of all. The public is bewildered by what is conceptions of missiles that don't exist, and, anyway, couldn't fly as the artists conceive them, and by half-truths, understatements, and exaggerations about missiles that do exist or are about to exist or will never exist.

Do you agree to that?

PUBLIC NOT WELL INFORMED RE MISSILES

General PUTT. I agree that there is a considerable amount of confusion and misinformation in the public print.

Senator SYMINGTON. Will you repeat your answer?

General PUTT. I agree that there is a lot of confusion and misinformation in the public print on guided missiles.

Senator SYMINGTON. I will not ask further questions against this article.

Mr. Counsel, are you going to go into the missile picture now?

Mr. HAMILTON. Yes. What is the pleasure of the committee as to the time of adjournment?

Senator SYMINGTON. I hope we will go along as late as possible tonight. Can we go a little longer, and adjourn at 5:30?

Senator SALTONSTALL. I have two questions, Mr. Chairman, if I may, that I want to ask.

COOPERATION WITH NATIONAL COMMITTEE ON AERONAUTICS

General, I meant to ask you will you describe very briefly the cooperation and understanding that you testified about yesterday between the National Committee on Aeronautics and your work. I always appreciated what they were doing. You said you were cooperating with them. Would you tell how that has worked out?

General PUTT. This works very fine. The mechanism by which we effect this coordination, for example, I personally am a member of the National Advisory Committee for Aeronautics.

Senator SALTONSTALL. You are on it?

General PUTT. I am a member. As an example the Committee itself has a lot of working subcommittees in different fields of science and research in which they are interested and doing work. These subcommittees are composed of people from industry, from the Army, from and Navy and the Air Force.

The subcommittee structure, I believe, is something in the order of 16 different subcommittees covering various research fields. There is a member, 2 members, from the Air Force on the main committee, 2 members from the Navy. There is constant exchange of infor-

mation. In addition, there are members of the NACA and its staff who are members of the committees of the Department of Defense in the Office of the Assistant Secretary of Defense for Research and Development.

Senator SALTONSTALL. On the problem of basic, pure research on airplanes, aerodynamics, and that sort of thing, if you have a problem, you sometimes turn it over to them, do you not?

General PUTT. We depend tremendously on the NACA.

Senator SALTONSTALL. On aerodynamics?

General PUTT. On aerodynamics, the field of propulsion, and structures.

Senator SALTONSTALL. Air-tunnel work?

General PUTT. Air-tunnel work; yes, indeed.

Senator SALTONSTALL. In other words, there is some research done by them that helps you?

General PUTT. Absolutely.

COOPERATION WITH ATOMIC ENERGY COMMISSION

Senator SALTONSTALL. On the Atomic Energy Commission, I think they have some $400 million of funds. How much cooperation is there between you and the Atomic Energy Commission in research work?

General PUTT. A very great deal. In fact, they do for the Air Force all of the work that invoives the nuclear parts of warheads, the reactor research and development that goes into the aircraft nuclear propulsion program. In other words, they are charged by the Congress with carrying out the atomic nuclear research and development and they do this for the Department of Defense. (D)

Senator SALTONSTALL. Are you on any committee there?

General PUTT. No, not at this time.

Senator SYMINGTON. Will the Senator yield?

Senator SALTONSTALL. Certainly.

Senator SYMINGTON. Is anybody reporting to you on any committee of the NACA?

LIAISON

General PUTT. I have my deputy, General Thatcher, who is a member of the Military Liaison Committee, and then I have an assistant for atomic energy matters who is not officially a member, but is in constant contact with the AEC.

Senator SYMINGTON. And on the NACA the same way?

General PUTT. Pardon?

Senator SYMINGTON. And NACA and AEC, do you have people report to you in liaison with those two agencies?

General PUTT. Yes, sir; at practically every echelon.

Senator SYMINGTON. AEC and NACA.

General PUTT. Right, Senator.

Senator SYMINGTON. It is the same for both. Is that correct?

General PUTT. It is a little closer between NACA and the Air Force than it is in AEC, but this is not to indicate a deficiency, there is a difference in the requirements.

Senator SYMINGTON. And that is practically at every echelon?

General PUTT. That's correct.

Senator SALTONSTALL. Am I correct—I am not sure I am—did not the Atomic Energy Commission 4 or 5 years ago slow up their work and put their research on other aspects, rather than a nuclear powered airplane? I mean, they slowed up 4 or 5 years ago, and then have come on again in the last couple of years. Is that a fair statement?

General PUTT. I would have to go back and examine the record to see if that was an actual fact. However, I would be surprised if that action is not indicated, that it did drop off, because they matched to a degree the efforts that we put on the project. There is no sense in them getting away ahead of our part of the research and development program for aircraft nuclear propulsion. Hence there is some relationship between how much effort we put on it and how much they put on it. Also the AEC is subject, of course, to priorities of work also, just as the Department of Defense is.

Senator SALTONSTALL. Just one other question on a general subject. This is not on that subject. If you feel free to answer it, do so. If you would rather not, don't.

TREVOR GARDNER

In your experiences with Mr. Trevor Gardner, he isn't the smoothest worker in committees that there is, is he?

General PUTT. He is an individualist; yes.

Senator SALTONSTALL. Like every distinguished scientist.

General PUTT. Quite an individualist. This I don't think is derogatory, my saying this. We need individualists.

Senator SALTONSTALL. Well, I guess you do.

Senator SYMINGTON. Inasmuch as I brought up Mr. Gardner's article, I wish, General Putt, that you would present to the committee what you think of Trevor Gardner, frankly and forthrightly.

General PUTT. I thought Mr. Gardner was a very competent and capable individual. I furthermore think that he did some very fine things for the Air Force. I found it very enjoyable working for him. Sure we had differences of opinion, differences in judgments, differences in how we thought things ought to be done, but this occurs with anybody we work with.

Senator SALTONSTALL. I am right when I say he is one of the most distinguished scientists in the country?

Senator SYMINGTON. I ask another question. He was recommended to our committee by Mr. Harold Talbot, Secretary of the Air Force. Mr. Talbot recommended him highly. I supported the recommendation.

Have you any reason to believe that at any time in any way Mr. Gardner did anything that wasn't, in his opinion, in the best interests of the country?

General PUTT. I would have no reason to suspect that he had.

Senator SYMINGTON. Do you believe that he was an able man?

General PUTT. Yes, sir.

Senator SYMINGTON. Do you believe that a large majority of everything he says in this article is essentially correct—in this report that he has made to the American people through Look magazine?

General PUTT. As it presents the general picture, I generally agree with what he has said.

Senator SYMINGTON. In your opinion, Mr. Trevor Gardner was an able, honorable man. He was not a scientist. Is that correct?

General PUTT. I would not class him as a scientist, as such. He had a basic engineering education that was comparable to my own.

Senator SYMINGTON. He was an engineer by training and a businessman by profession, is that correct. At least that is the way he was presented to the committee.

General PUTT. That is correct.

Senator SYMINGTON. Thank you, Senator.

LONG RANGE BALLISTIC MISSILES

Mr. HAMILTON. Turning now to the ICBM and the IRBM, General Putt; I would like to ask you, lead you in this, if I may, just for the sake of time, if I am right in my impression that there are four principal elements that go into a long-range ballistic missile, to wit: the warhead, the guidance system, propulsion system, and the device that contains those other three elements. Would you say that is a fair statement?

General PUTT. That is a fair statement.

Mr. HAMILTON. And am I also right that, insofar as the warhead is concerned, at least the nuclear aspect of the warhead, the research and development as to that is primarily a matter for the responsibility of the Atomic Energy Commission?

General PUTT. That is correct.

Mr. HAMILTON. Do you have, with respect to the work that your office is doing on the intercontinental ballistic missile, some responsibility with respect to the container for the warhead, where the warhead fits in?

General PUTT. That is correct. (D)

Mr. HAMILTON. Then is the Air Force also responsible with respect to its ICBM, its work in the IRBM field, for the other three elements of those missiles, the shields, so to speak, the propulsion system and guidance system?

General PUTT. That is correct. (D)

Mr. HAMILTON. May I interrupt here before I forget to mention another point.

In connection with material that you supply as to funds requested and funds made available for research and development to the Air Force with reference to the nuclear airplane in response to Senator Jackson's question, could you carry that information back to the year 1946 when I believe you mentioned you first became interested?

General PUTT. With relation to?

Mr. HAMILTON. The nuclear airplane, so that we get the total picture.

General PUTT. Yes.

Mr. HAMILTON. Now, coming back to the ICBM, what measure are you taking, can you take, in working on those problems? (D)

Do you conduct experiments, make theoretical studies, and things of that character?

General PUTT. Yes. First, of course, you conduct theoretical studies, paper studies, and calculations to try to put some boundary limits on the knowledge that is required. (D)

SOVIET MISSILE CAPABILITY

Mr. HAMILTON. Upon the basis of your knowledge as to the research and development resources potential, the state of the art in the period, let us say, of 1950–52 and thereabouts, if the Russians had started at that time with the view to developing intercontinental ballistic missiles, would they, in your judgment, have had the capacity to develop the kind of missile that we think they have and, at the same time, have been working on an intercontinental ballistic missile, from the standpoint of their capacity?

Do you think that they had the capacity in 1950–52 to work both on the shorter range missile, which we believe they have, and also on an intercontinental ballistic missile?

General PUTT. I think they had the capability; yes.

Mr. HAMILTON. And if they had pursued that course at that time, the course of developing a short-range missile, as part of the program of the long-range missile, would they, in your opinion have been ahead of our present position in terms of where we now stand with respect to the ICBM, had they done so?

QUESTION OF SOVIET ADVANTAGE

General PUTT. They would have had an advantage.

Mr. HAMILTON. Would that advantage have been in time? They would have been farther along.

General PUTT. Yes; that's right.

Mr. HAMILTON. Would you say that was a significant or insignificant advantage, assuming they had done these things?

General PUTT. I believe it could be relatively significant; yes.

Mr. HAMILTON. So far as we know, is there any reason to suppose that they did not do that? Do we have any intelligence that you know about of a positive character that indicates that they did not do that?

General PUTT. I have no knowledge that they did not. (D)

Mr. HAMILTON. If you were making plans for research and development and those plans involved an assumption as to whether the Russians were ahead of us or not in connection with the development of the intercontinental ballistic missile, what would you assume in that regard in making your own research and development plans?

General PUTT. As a military man, I would have to assume that with this capability I ought to make my plans on the basis that they may be developing and might have available for use such a weapon.

Mr. HAMILTON. That is before we might have it?

General PUTT. Before we might.

Senator SYMINGTON. I would like to ask a couple of questions here, if I may, about the NACA and the Atomic Energy Commission.

You say that back in 1946 or 1947 you became interested in an atomic plane?

General PUTT. Yes, sir.

Senator SYMINGTON. How was your interest expressed?

NUCLEAR PROPULSION STUDIES

General PUTT. At that time, that is about the time—I can't remember the exact date, but about the time—that the Air Force organized the so-called NEPA project.

Senator SYMINGTON. NEPA, standing for what?

General PUTT. Nuclear energy for propulsion of aircraft. The contractor in this case was the Fairchild Aviation Co. The initial objective of the NEPA project was to study the feasibility of constructing a nuclear propelled aircraft.

In that period of time I was Deputy Chief of the Engineering Division out at Wright Field, so I had an overall interest in that along with the rest of the research and development program of the Air Force.

Senator SYMINGTON. To carry that on, if that was 1946 and 1947, you let a contract with Fairchild. Take the year 1948 or 1949, what happened then? In what year was there a major change in the approach to this problem.

General PUTT. In 1951 the studies of the NEPA project were completed, the feasibility had been relatively well established, at least it had not been proven unfeasible, and at that time the character of the program changed.

The NEPA project was closed out, terminated as a management decision, not lack of funds or anything of that nature, but the job was completed that NEPA was supposed to do.

Senator SYMINGTON. Roughly, when was that?

General PUTT. 1951.

Senator SYMINGTON. 1951?

General PUTT. Yes, sir. Then a contract was made with the General Electric Co. for further development leading toward a specific propulsion system which could be used to power an aircraft. Essentially, that, at that time, represented the total effort then in the propulsion field, nuclear propulsion field.

Of course, you have to have the engine before you can worry about the airplane. But all the time that the propulsion program with GE was going on, we had studies at several airframe contractors in order to keep track of the propulsion system and attempt to design it into paper designs of an airplane. Later, there was a contract given to Convair to take a B–36 and build a test bed.

Senator SYMINGTON. In what year was that?

General PUTT. It was 1951. I may be off on these dates.

Senator SYMINGTON. 1951?

General PUTT. 1951.

Senator SYMINGTON. In 1951 you had two contracts going, one with General Electric and one with Convair re an atomic airplane; is that correct?

General PUTT. Aimed at an atomic airplane propulsion system. There were other contracts for studies, aircraft design studies, and other propulsion approaches, but the main effort was with Convair and General Electric.

Senator SYMINGTON. Name 2 or 3 of the other companies involved.

General PUTT. Lockheed was doing a program, an airframe study; Boeing likewise had a contract. North American did a little work.

In late 1951 Pratt & Whitney was brought into the program on a propulsion system, but using a different technical approach than was

being used by General Electric. Essentially those contractors have all remained in the program, Pratt & Whitney, General Electric, Lockheed, Convair.

Senator SYMINGTON. That is fine. I did not mean to interrupt you, but I note the time is short. That was 1951?

General PUTT. Late in 1951 was the last event, when Pratt & Whitney was added to the propulsion system.

Senator SYMINGTON. Between 1952 and 1953 was there any change in that?

General PUTT. Not in the alinement of contractors. The effort has essentially been continued by them.

Senator SYMINGTON. Have you been working with the AEC on this?

General PUTT. Yes.

Senator SYMINGTON. Is your program any different in the last 5 years than it was in the previous 5 years?

RECENT IMPROVEMENT AFTER 1953 CUTBACK

General PUTT. To the extent of scope and effort; yes. It has improved. There was a period there, I believe—Mr. Chairman, you referred to some action in 1953 that——

Senator SYMINGTON. What was that action?

General PUTT. The action when the program was considerably cut back and some of our work had to slow up.

Senator SYMINGTON. What happened?

General PUTT. You referred to the Secretary of Defense having——

Senator SYMINGTON. Yes; I remember now. I did refer to that. What was the change as a result of his position?

General PUTT. We had to slow up the program for lack of funds.

Senator SYMINGTON. And did he transfer the program to the AEC or the NACA or anywhere else?

General PUTT. No, sir.

Senator SYMINGTON. It was not a case of transferring it to another agency?

General PUTT. No.

PROPULSION DEVELOPMENT SLOWED DOWN BY BUDGET POLICY

Senator SYMINGTON. It was just a case of giving it a low priority so that you slowed it up because of lack of funds. Is that correct?

General PUTT. That's correct.

Senator SYMINGTON. I have no further questions on my part, Senator.

Have you any?

Senator SALTONSTALL. No.

GUIDELINES

Mr. HAMILTON. Is there any objection, Mr. Chairman and Senator Saltonstall, if we put into the record at the appropriate place in General Putt's testimony where he referred to the guidelines, copies of these guidelines?

Senator SALTONSTALL. Have you got the 1957 one?

Mr. HAMILTON. Yes, sir.

Senator SYMINGTON. That stimulates 2 or 3 more questions, very quickly.

This guidelines business, I understand it better as a result of the questioning of Senator Jackson. As I get the guidelines status, you can ask for as much money as you want as long as you ask for the amount that you are told you can have?

General PUTT. Your statement is correct.

Senator SYMINGTON. Thank you.

Without objection, these exhibits will be put in at this point.

(The documents above referred to are as follows:)

ASSISTANT SECRETARY OF DEFENSE,
RESEARCH AND DEVELOPMENT,
*Washington, D. C., May 11, 1954.*

Memorandum for: The Secretary of the Army
The Secretary of the Navy
The Secretary of the Air Force
Chief, Armed Forces Special Weapons Project
Director, National Security Agency
Director, Armed Services Technical Information Agency

Subject: Fiscal year 1956 planning assumptions and guidelines for research and development.

1. The attached planning assumptions and guidelines for research and development are submitted for use in the review of the initial fiscal year 1956 budget estimates for this activity.

2. In the event of changes in the research and development budget and appropriation structure for accounting procedures, this office, in coordination with the Assistant Secretary of Defense (Comptroller), will make corresponding adjustments in the planning figures upon recommendation of the department or agency concerned.

3 .In accordance with agreement with the Assistant Secretary of Defense (Comptroller) it is requested that the project listings required by memorandum for the budget officers of the military departments from the Deputy Comptroller for Budget, Assistant Secretary of Defense (Comptroller), dated March 26, 1954, be submitted to this office by September 1, 1954.

DONALD A. QUARLES.

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ASSISTANT SECRETARY OF DEFENSE,
RESEARCH AND DEVELOPMENT,
*Washington, D. C.*

Subject: Fiscal year 1956 planning assumptions and guidelines for research and development.

1. *General.*—The military research and development program for fiscal year 1956 and the years ahead should be based on the cardinal principle that maximum advantage should be taken of any period of comparative peace that may lie ahead to push toward better weapons and weapon systems and thus to prepare in advance for any major conflict that may be forced upon us. This calls for a vigorous and steady research and development program, well balanced between the long-range values of underlying research and the nearer term values of weapon development. Such a basis recognizes the departmental position that a stable RD program will be maintained even though at the expense of other programs. At the same time we must recognize that the building up to present research and development levels was precipitate and handicapped from a planning standpoint by the exigencies of the Korean conflict. The program ahead should assume a determined effort to improve the management of the research and development program by better coordination among the departments and by sharper control of duplicative situations.

It appears, however, that the potential economies of management improvement may be more than offset by the increase cost of more complex developments. Major technological improvements result in greater incremental costs and, in addition, the technological advances require more costly facilities which add appreciably to the program overhead.

In light of the fiscal history of research and development since World War II and based on the assumption that the program will not be subject to further inflationary decreases in the value of the dollar, it is believed that it would be

consistent with the above principles to stabilize our level of expenditures at an annual rate of $1.2 billion subject, however, to annual review. In line with this, the following planning assumptions and guidelines will be used for preparation of the fiscal year 1956 research and development program.

2. *Expenditures.*—It should be assumed that there will not be any special expenditure controls on research and development in fiscal year 1956. It is to be understood, however, that the three military departments and the OASD (Comptroller) will maintain a running account of R. and D. expenditures for evaluation in comparison with overall R. and D. expenditure projections and may raise specific questions from time to time.

3. *Financing.*—Individual reserve funds for emergencies and "breakthroughs" will not be included in the estimates of each department or agency with the exception of research and development contracts where longer financing can definitely be justified, budget estimates for fiscal year 1956 will include funds for no more than 12 months' estimated work to be accomplished plus essential contractors' commitments. This is applicable both to contractual work and to Government establishment work.

4. *Program balance.*—The fiscal year 1956 budget estimates should reflect emphasis among the various research and development programs consistent with the general and specific OSD guidance as related to selectivity of projects, simplification, parallel developments, curtailment and elimination of programs and facilities.

5. *Supporting research.*—The fiscal year 1956 budget estimates for supporting research will be confined to those fields which seem to have a high probability of providing useful results to the mission of defense.

6. *Social sciences.*—It is important that sufficient funds be included for fiscal year 1956 to insure an adequate program in the social sciences, including the psychological warfare field. However, only those projects will be included which show promise of making a significant contribution to the mission of defense.

7. *Performance in nondefense Federal agencies.*—It should be assumed that the same policy with respect to transfer of research and development funds to nondefense agencies effective in fiscal year 1955 will continue in fiscal year 1956 and subsequent years. The fiscal year 1956 budget estimates will include only those allocations to nondefense agencies that cover performance of certain services for military departments in fields which are the normal province of those agencies and in which they possess unique skills and facilities.

8. *Future tests.*—AFSWP fiscal year 1956 estimates should include only funds for those tests which are sufficiently firm as to planning and administrative authorization to permit relatively accurate determination or requirements.

9. *Emergency funds.*—For planning purposes it should not be assumed that any particular allocation, other than those already approved, to a military department or agency from the fiscal year 1954 emergency fund will be forthcoming.

10. *Planning figures.*—Following are the initial fiscal year 1956 planning figures for the Army, Navy, Air Force, and joint agencies:

*Fiscal year 1956 planning figures*

| Department or agency: | *In thousands* |
|---|---|
| Army | $329,130 |
| Navy | 389,271 |
| Air Force | 429,000 |
| National Security Agency | 13,500 |
| Armed Forces special-weapons project | 12,250 |
| Armed Services Technical Information Agency | 2,000 |
| Materials Advisory Board (formerly NAB) | 120 |
| Emergency fund | 35,000 |
| Total | 1,210,271 |

The planning figures apply to the same elements of direct and direct support costs of research and development as were included in the fiscal year 1955 budget estimates as submitted to the Congress. If the fiscal year 1956 estimates are prepared on a different basis, as a result of changes in budget structure or general estimating policies, or for other reasons, then the department or agency concerned, with the approval of the Assistant Secretary of Defense (Comptroller), will make corresponding adjustments in the planning figures set forth above.

ASSISTANT SECRETARY OF DEFENSE,
RESEARCH AND DEVELOPMENT,
*Washington, D. C., April 20, 1955.*

Memorandum for:
The Secretary of the Army.
The Secretary of the Navy.
The Secretary of the Air Force.
Chief, Armed Forces special-weapons project.
Director, National Security Agency.

Subject: Guidelines for preparation of fiscal year 1957 research and development budget.

1. There is attached a copy of guidelines for preparation of the fiscal year 1957 research and development budget.

2. These guidelines have been coordinated with the ASD (Comptroller) who concurs in their use for planning purposes.

3. Project listings of the proposed items for the fiscal year 1957 research and development budget should be submitted to this office by September 1, 1955.

DONALD A. QUARLES.

ASSISTANT SECRETARY OF DEFENSE,
RESEARCH AND DEVELOPMENT,
*Washington, D. C., April 20, 1955.*

Subject: Fiscal year 1957 research and development budget guidelines.

1. It is the purpose of the document to provide assumptions and guidelines to be utilized in the preparation of the fiscal year 1957 research and development budget estimates for submission to the Secretary of Defense.

2. *Program level.*—It should be assumed that the research and development effort in the Department of Defense will continue in fiscal year 1957 and subsequent years at a level of expenditure of approximately $1.2 billion (fiscal year 1955 direct cost category basis) which is approximately $1.4 billion, fiscal year 1956 accounting basis).

3. *Special requirements.*—Issue of the technological capabilities panel and project lamp light reports creates an uncertainty in the fiscal year 1956, fiscal year 1957, and future research and development budget situations pending a resolution of the recommendations of these reports. It should be recognized that additional program requirements resulting from these reports may require an increase in the level of the program. The fiscal year 1957 budget should include the most important projects in the program within the level established herein. The departments will consider the impact of these new requirements on the current prog am and should evaluate the necessity of an increase in program level, not to exceed 20 percent, to permit work on lower priority projects which might otherwise have to be omitted from the program.

4. *Program balance.*—Budget estimates for fiscal year 1957 should reflect emphasis on the various research and development programs consistent with the general specific Assistant Secretary of Defense (R. and D.) guidance as related to selectivity of projects, simplification, parallel developments, and curtailment and elimination of programs.

5. *Planning figures.*—The initial research and development budget estimates for fiscal year 1957 on the fiscal year 1955 direct-cost basis will not exceed the following:

| | | |
|---|---|---|
| Army | | $328,000,000 |
| Navy | | 388,000,000 |
| Air Force | | 427,000,000 |
| Joint agencies | | 32,600,000 |
| AFSWP | $11,500,000 | |
| NSA | 14,000,000 | |
| ASTIA | 2,000,000 | |
| Materials laboratory and board | 1,100,000 | |
| ANDB [1] | 4,000,000 | |
| Army | $750,000 | |
| Navy | 1,250,000 | |
| Air Force | 2,000,000 | |

[1] For DOD share of administrative expense and for ANDB-sponsored contracts to be administered by the Departments. Preliminary figures subject to adjustment by ANDB.

The additional costs totaling some $207,662,000 in fiscal year 1956 (Army, $26 million; Navy, $42,662,000; Air Force, $139 million) which were included in

direct research and development appropriations for the first time in fiscal year 1956 are not included in the above planning figures and should be estimated separately.

6. *Accounting adjustments.*—The planning figures herein apply to the same elements of cost for research and development as were included in the fiscal year 1955 direct-cost category. If the fiscal year 1957 estimates are prepared on a different basis as a result of changes in budget structure of accounting practice, then the department or agency concerned, with the prior approval of the ASD (Comptroller), will make corresponding adjustments in the planning figures set forth above.

7. *Emergency funds.*—It should be assumed that an emergency fund in the amount of $35 million will again be provided for the use of the Secretary of Defense. Reserve-fund provisions for emergencies and breakthroughs will not be included in the fiscal year 1957 estimates of any department or agency. However, provision should be made within the planning figures for those new programs or accelerated effort on existing programs for which a definite need exists at the time the budget is prepared as a result of policy decisions or planning studies.

8. *Military-civilian personnel.*—The department and joint agencies are encouraged to substitute civilian personnel for military personnel in those cases where efficiency will be increased or economy effected in accordance with the provisions of section 720, Public Law 458, 83d Congress. When such substitution is appropriately identified, corresponding accounting adjustments will be made in the planning figure.

9. *Work in Government Facilities.*—During the past few years, the percentage of the total research and development funds being spent for work performed in Government facilities has increased. This is regarded as an undesirable trend which the departments will undertake to counteract.

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ASSISTANT SECRETARY OF DEFENSE,
RESEARCH AND DEVELOPMENT,
*Washington, D. C., December 9, 1953.*

Memorandum for the members of the Research and Development Policy Council.
Subject: Financial Plans for the Research and Development Program.

1. The fiscal year 1955 budget estimates which were submitted by the Departments to the Secretary of Defense contained requests for new obligational authority for direct research and development totaling approximately $1.3 billion. Discussions with the Assistant Secretary of Defense (Comptroller), representatives of the Bureau of the Budget, and members of the Research and Development Policy Council have indicated that such a total is incompatible with the overall objective of reducing Department of Defense expenditure levels and that a number of actions should be initiated in the research and development area to insure conformance with that objective.

2. In order to assist you in your financial planning I will outline in this memorandum the general principles to which we agreed at our meeting of December 7 and the distribution of funds among the departments which I will recommend to the Secretary of Defense.

3. It will be our objective to reduce the Department of Defense direct research and development expenditures to a $1.2 billion level in fiscal year 1955.

4. I will continue to review presently pending and future requests from the departments to increase the current schedules of obligations and will recommend release of the additional funds in all cases where I consider the request to be fully justified. However, these recommended releases will be made with the understanding that each department will reconsider its original plans for obligation of this money and adjust them in consonance with the objective stated in paragraph 3.

5. The total new obligational authority to be requested for fiscal year 1955 direct research and development for the three departments, joint agencies, and the emergency fund will be $1.2 billion.

6. Based on the assumption that the fiscal year 1955 direct research and development appropriations will contain the same elements of cost which were included in fiscal year 1954, I am recommending the following distribution of the $1.2 billion new obligational authority for fiscal year 1955:

| | *Millions* |
|---|---|
| Army | $323.855 |
| Navy | 381.195 |
| Air Force | 431.317 |
| Joint agencies | 28.633 |
| Emergency fund | 35.000 |
| Total | 1,200.000 |

It is understood that because of accounting changes between fiscal year 1954 and fiscal year 1955 certain items will shift to and from the direct research and development category. Due to accounting changes of this type that have been identified and agreed to by the ASD (Comptroller) to date the figures above should be changed to: Army, $327.855 million; Navy, $392.195 million; Air Force, $428,317 million; total, $1,212.000 million. Further adjustments of this nature may be required.

7. In order to reduce research and development expenditures which are now running at a rate of about $1.3 billion per year to $1.2 billion in fiscal year 1955 it will be necessary for each Department to take special administrative action. This should be done on a selective basis to insure that adequate provision is made for the most important programs and projects. I am recommending that each department reduce its expenditures in fiscal year 1955 to the levels indicated in the previous paragraph.

DONALD A. QUARLES.

Senator SYMINGTON. We will recess the hearing to room 212 tomorrow.

(Whereupon, at 5:30 p. m., an adjournment was taken until Friday, May 18, 1956, at 10 a. m.)

# STUDY OF AIRPOWER

FRIDAY, MAY 18, 1956

UNITED STATES SENATE,
SUBCOMMITTEE ON THE AIR FORCE
OF THE COMMITTEE ON ARMED SERVICES,
*Washington, D. C.*

The subcommittee (consisting of Senators Symington, Jackson, Ervin, Saltonstall, and Duff) met, pursuant to notice, at 10 a. m. in room 212, Senate Office Building, Senator Stuart Symington (chairman of the subcommittee) presiding.

Present: Senators Symington and Duff.

Also present: Fowler Hamilton, general counsel; Ramsay D. Potts, Jr., associate general counsel; Fred B. Rhodes, legal consultant to Senator Saltonstall; Edward C. Welsh, assistant to Senator Symington; and Wallace L. Engle, staff member.

Brig. Gen. F. E. Rouse, USAF; Maj. Gen. Samuel R. Brentnall, Assistant Chief of Staff for Guided Missiles; Brig. Gen. Charles M. McCorkle, Deputy Chief of Staff for Guided Missiles; Lt. Col. William F. LaHatte, Office, Chief of Research and Development, United States Army; Mansfield T. Sprague, General Counsel, Department of of Defense; Capt. S. S. Searcy, Jr., USN., Office of Chief of Naval Operations.

Senator SYMINGTON. The committee will come to order.

Mr. Counsel, you were asking some questions of General Putt when we recessed last night.

Mr. HAMILTON. That is correct, sir, in the missile field.

Senator SYMINGTON. Would you continue?

Mr. HAMILTON. I will. However, before I return to the discussion of missiles, General Putt, I would like to ask you if you would care to state for the record the status of the financial plan for fiscal year 1957 to which you referred yesterday, as I recall it, in giving us your estimates as the amount of funds that could be profitably or usefully employed in research and development during that year if they were made available.

## TESTIMONY OF LT. GEN. DONALD L. PUTT, DEPUTY CHIEF OF STAFF FOR DEVELOPMENT, HEADQUARTERS, USAF; ACCOMPANIED BY COL. ROBERT L. JOHNSTON, DEPUTY DIRECTOR OF RESEARCH AND DEVELOPMENT, DCS/O, HEADQUARTERS, USAF; AND COL. CARL J. REBER, CHIEF, PROGRAM FUNDING DIVISION, ASSISTANT FOR DEVELOPMENT PROGRAMS, DCS/D, HEADQUARTERS, USAF—Resumed

General PUTT. Yes. All of the figures that I quoted yesterday for 1957 as to the probable Air Force allocation of the funds that appear

to become available in 1957 among the various projects and the basis on which I estimated deficiencies that would occur in those funds is based on this 1957 financial plan.

DEVELOPMENT OF FISCAL YEAR 1957 BUDGET PLAN

Mr. HAMILTON. How was that plan developed, General?

General PUTT. The plan is developed within the Air Force on the basis of taking the potential available resources and distributing those, allocating those among the work to be done.

Mr. HAMILTON. You mean by resources funds, or do you mean people?

General PUTT. Funds, in accordance with priorities and where we think the funds can be most effectively used.

We are right in the budget cycle now where the fiscal year 1957 financial plan is being prepared, so I think the status of its preparation is significant so the committee can recognize how valid these figures are.

The financial plan has been reviewed by my staff and I have approved it. It has been submitted to the Air Force Aircraft and Weapons Board for review, and they have approved it and forwarded it to the Air Force's Budget Advisory Committee.

It has been considered by the Budget Advisory Committee and will be submitted to the Office of Assistant Secretary of Defense for Research and Development on the 22d of May which is some days hence.

Senator SYMINGTON. What is that?

General PUTT. This is the fiscal year 1957 financial plan, and being the most authoritative document that we have on what we would propose to do next year with the dollars that will be made available, this is the only document which I can quote from to indicate what I think the deficiencies are going to be next year.

I am pointing out that the financial plan has not yet been reviewed and approved by the Chief of Staff or the Secretary of the Air Force, and it goes to OSD, Research and Development on the 22d of May for further review and approval, so that there is still the possibility that OSD may direct a different distribution of the funds than my office has recommended.

Senator SYMINGTON. Senator Duff, may I ask a question for clarification on that?

Senator DUFF. Sure.

Senator SYMINGTON. Will you please ask any questions, also. Am I to understand that this has to do with the fiscal year 1957 budget?

General PUTT. Yes, sir.

Senator SYMINGTON. And that therefore what it will be is based on the money you now know you have been allowed in the fiscal year 1957 budget. It will be your recommendation to the Department of the Air Force as to how that money should be allocated?

General PUTT. That is correct.

Senator SYMINGTON. But you do not know whether that will be the final allocation until it is given to you from higher authority as the final allocation?

General PUTT. That is correct.

Senator SYMINGTON. And there may be changes?

General PUTT. That is correct.

Mr. HAMILTON. Thank you.

I think that clarifies that, General. One other related point.

You have mentioned you feel that your needs for additional funds in fiscal 1957 will be in the order of 200 to 300 million dollars?

General PUTT. Yes.

Mr. HAMILTON. That is for research and development properly so-called, that is pure research and development?

General PUTT. That is correct.

Mr. HAMILTON. That does not relate to contributions to research and development in its broader conception that you may get from other sources?

General PUTT. No.

Mr. HAMILTON. Now in connection with that latter point, in the event you were able to get the additional funds which you think are necessary for research and development properly so-called, would there then have to be made available additional sums from such other sources as you mentioned that contribute to research and development, such as public works, procurement of test models, or personnel funds?

General PUTT. One might not be able to identify a direct relationship.

Mr. HAMILTON. No, but I am just asking for your opinion.

General PUTT. But indirectly, in general the way research and development work is funded, it calls for matching funds from other accounts.

Mr. HAMILTON. Would you have any judgment as to the order of magnitude of what you would need from these other sources, such as construction and procurement, if you were to increase your R. and D. funds of the kind you have given us figures for?

### FISCAL YEAR 1957 SHORTAGE OF FUNDS

General PUTT. In general the increase that I have spoken of for the P–600 funds—R. and D. funds of roughly $250 million—would be applied to the initiation of new projects and the continuation of those projects which have not yet proceeded to the point where they are eligible for the application of funds from other areas, not completely ineligible but dollar requirements from say procurement funds, for instance, might not be significant.

In the field of public works though, additional facilities funds I believe are needed. Because of the difference in lead times between facilities and the specific projects that the $250 million would initiate, it is difficult to indicate a direct relationship, but on a qualitative status looking at the facilities that we have available for the overall job that I see has to be done ahead—I would like the opportunity to refine the figure for the record later, but a ball-park figure, it would seem to me somewhere between 50 and 100 million dollars more for public works next year could well be used.

Senator SYMINGTON. Could I ask several questions there?

First, General, will you consider yourself sworn please?

General PUTT. Yes, sir.

Senator SYMINGTON. And you have in the testimony that you have given since the beginning of the hearing?

General PUTT. Absolutely; yes, sir.

Senator SYMINGTON. That is my error, not swearing you earlier. I am sorry.

The Counsel asked you a question.

You said a figure of 200 to 300 additional for next year.

General PUTT. That has been my statement.

Senator SYMINGTON. Would it be for the fiscal year 1957?

General PUTT. Fiscal year 1957.

Senator SYMINGTON. So that is what you are short then in the decision; is that correct?

General PUTT. Yes, sir.

Senator SYMINGTON. So if it was another 50 million to 100 million on public works, that is not what you think you will need for fiscal year 1958 but what you think you are short for the fiscal year that will shortly be upon us, within 6 weeks or so?

General PUTT. That is correct.

Senator SYMINGTON. Is that correct?

General PUTT. That is correct.

Mr. HAMILTON. Apart from any additional research and development funds of the 600 category, are your needs with respect to funds from public works procurement funds that contribute to research and development adequate in terms of your present budget for research and development?

General PUTT. I think I would have to answer I don't honestly know.

Mr. HAMILTON. Now, General, turning to the question of the missiles, to the long-range missiles, ICBM and IRBM, I wonder if you would be in a position to give the committee just a broad narrative account of what the Air Force has done in that field, touching upon the highlights, having in mind that if you care to do so after the transcript is made available to you, you can supplement it and edit it, subject to the fact, of course, that the gentlemen might want to ask you additional questions based upon your editing of it; of course you would answer them.

General PUTT. This will be rather rough and general.

Mr. HAMILTON. I appreciate that but I think it might set it in perspective.

### ICBM RESEARCH BEGINNING IN 1945

General PUTT. In 1945, perhaps late 1945, the Air Force recognized the possible significance of an intercontinental ballistic missile if one were feasible and one could build such a weapon.

In fact, in 1945 a project was initiated for study and research of a guided missile which would accurately cover surface targets at ranges from 1,500 to 5,000 miles. (D)

Senator DUFF. Pardon me, was that in 1945?

General PUTT. 1945. This was just a study and feasibility determination at first, and as a result of the study, a ballistic missile—I would not call it a weapon because it did not have a warhead at this time, it might be more accurately classified as a research test vehicle, or ballistic vehicle was constructed that could be fired.

We built three of those, and they were successfully launched as early as 1949.

There was no effort in the design of this missile to attain a long range. We were more concerned at this point with the development

of the stability and control of the weapon as it was being launched vertically from the ground, from zero velocity up to whatever velocity the rocket motors that we had available at that time would give this vehicle.

All three of these were variously successful and demonstrated for the first time that actual stability and control of the missile——

Mr. HAMILTON. Internally or externally?

General PUTT. Internally. Well, it controls it externally as well.

Mr. HAMILTON. As well, but there was some internal control?

General PUTT. Yes. It demonstrated for the first time that we could control the missile and keep it upright and direct it in the direction that one wanted it to go. (D)

Mr. HAMILTON. Then what happened?

General PUTT. Also, we demonstrated at that time the possibility of very lightweight structures, which in themselves are not self-supporting. (D)

Senator SYMINGTON. Excuse me. What were those three missiles that you say you fired in 1949?

General PUTT. They were research test vehicles because they were not weapons as such.

Senator SYMINGTON. What was their weight, so that the committee can understand.

Could you define for the record what their weight and size were?

General PUTT. I will provide that for the record.

Senator SYMINGTON. How far would they fly?

General PUTT. We were limited to the confines of the range at Holloman, which at that time was a maximum of about 100 miles, so there was no effort here in attempting to get range.

We will provide the characteristic.

Senator SYMINGTON. Was there an effort to get height?

General PUTT. I don't believe so. It was not an objective of the experiment at that time.

Senator SYMINGTON. What was the speed?

General PUTT. I will have to provide that.

(The information requested has been supplied in classified form.)

Senator SYMINGTON. Was it air breathing or nonair breathing?

General PUTT. This was nonair breathing. It was rocket propelled.

Senator SYMINGTON. Senator Duff, have you any questions?

Senator DUFF. Only one.

How accurate was it?

General PUTT. In the firing of those missiles it had no guidance equipment in and there was no attempt to get any accuracy at that time in those particular missiles.

Now, at the same time, we were carrying on research and development and studies to provide a guidance system.

At that time guidance was being done with radar. We were developing a radar for the guidance system that would actually control and guide such a missile if it became a weapons system.

There was a considerable amount of work done on the guidance system. (D)

Mr. HAMILTON. You mentioned 1949. Is that the date you had in mind?

General PUTT. That was the date on which we fired the three research vehicles, ballistic research vehicles.

One set of this guidance equipment which was built is now located at Patrick Air Force Base where we are using it as a part of the range instrumentation, not in the control of weapons but in the determination of the trajectory of weapons. We have found that it has been quite successful, and we think it has proven to be perhaps the most accurate electronic guidance device that has been built to date.

Mr. HAMILTON. What was the next significant step in the situation? I do not mean necessarily in respect to these, but in the general story.

General PUTT. Well, you may recall that around 1947 there was quite a review of all missile projects in the three departments, and this project, for lack of funds, was tapered back in its effort, and for a period of time, at least during one fiscal year. The funds were very low although I do not believe all the funds were taken off of it.

### LACK OF FUNDS FOR MISSILE IN 1949

Having built the missiles we probably put enough funds on it to carry out the firing of those missiles, but at that point the effort was again reduced to studies and feasibility work. In fact for 1 year, I think it was during 1949, which was fiscal year 1950, the company carried on the study with their own funds. We had no funds at all. Ⓓ

Mr. HAMILTON. Would the lack of funds during this period slow you down very considerably in your research and development work?

General PUTT. It did in this research field.

Mr. HAMILTON. How long did that situation continue?

General PUTT. Well, in 1951——

Mr. HAMILTON. I don't think you need to worry, General, about the details. Just give us the general view now and supply the details for the record.

### ICBM RESEARCH REINSTATED IN 1951

(The information requested has been supplied in classified form.)

General PUTT. In 1951 we reinstated the program and the company continued the work which has been almost continuous, and led into the current efforts of Convair on the ICBM program. Ⓓ

Of course one can question how fast we could have progressed toward an actual missile because the warhead situation was considerably in doubt at that time.

As a matter of fact, I think the characteristics that we had tried to establish on this particular program called for carrying about——

Mr. HAMILTON. Why don't you just deal with it if you will, General, so we can move along in sort of a summary way and then you can supply the details.

General PUTT. The project moved along then to the extent that we could apply resources to it until the committee, called together by Mr. Gardner—we can supply the date on that—the strategic missiles committee in which scientists got together and reevaluated the capabilities for supplying warheads with relatively high yields, and determinded that this was now feasible and capable of being done. Ⓓ

Of course this lent a great degree of feasibility and attractiveness to what one could then achieve or build in the way of an ICBM.

ICBM PRIORITY

Then on the 14th of May 1954 the Air Force directed within the Air Force that the ICBM project proceed with the highest Air Force priority that it was possible for us to give it.

Later the National Security Council also directed national priority in October 1955, and we have been proceeding under that guidance ever since.

Mr. HAMILTON. What were the kinds of problems that you encountered, beginning in 1954, I believe you said it was October when it was first given Air Force priority.

What were the kinds of problems that you encountered in pushing ahead with the project?

General PUTT. The usual problems that one encounters were all activities I guess. It takes a certain amount of time to obtain the necessary funds, the authority and approval for the construction of facilities, approval to expand a program and comply with the procedures that are prescribed for getting authority, approval, and all the decisions that are necessary to go ahead.

PROCEDURE TO GET FUNDS

Mr. HAMILTON. Can you describe briefly for the benefit of the committee the kinds of procedures that you go through?

Suppose you wished during this period to get funds for a particular purpose, assuming the funds had been appropriated and were available in that sense for the program, what procedures do you go through or did you go through, say in 1955?

General PUTT. Will it be satisfactory if I don't remember the exact details in a specific project?

I will give the general procedure which will be somewhat hypothetical, not hypothetical but representative.

Assuming that there were funds available, either having been programed for this specific project or could be made available from other resources, if it was either the establishment of a new project or a change in emphasis on one that had already been under way and approved, first the Air Force itself having decided that this was what it wanted to do, this being a research and development project, would prepare a request for approval to change the emphasis or initiate a new major project, which would go to the Office of the Assistant Secretary of Defense for Research and Development.

Here it would be processed through one of the several coordinating committees that have representatives from the three services and from the Office of Assistant Secretary of Defense present, to make sure that the project is coordinated, that there is no duplication, that there are no gaps being left in the program, and so forth.

Mr. HAMILTON. At this time were the other services engaged in developing the ICBM?

General PUTT. ICBM? Not at this time; no.

Mr. HAMILTON. Am I clear in my impression that you are now talking about a program relating to the ICBM in the period of time after the ICBM had been given top priority?

COMPLEX COMMITTEE AND PROCEDURAL STRUCTURE

General PUTT. Top priority. There were no programs in the other departments for an ICBM.

Mr. HAMILTON. But am I right in my impression that this representative account you are giving us would relate to one of the projects contributing to the ICBM which had then been given top priority?

General PUTT. Yes. Now, in addition to the coordinating committees in the Office, Secretary of Defense——

Mr. HAMILTON. You would go before just one of those?

General PUTT. Yes; just the guided missiles coordinating committee. Also associated with these committees are technical advisory panels. These are highly qualified specialists or consultants who are employed as consultants by the Department of Defense. Not always, but if the problem is of the character and the nature that OSD feels that they need consultant services, these panels—in this case I presume that it was only one, in the case of the ICBM it would only be one panel—also would review the project, more from the standpoint of its technical sufficiency and whether it made sense technically to continue.

If a program or project is then approved by the Office of Assistant Secretary of Defense for Research and Development, depending upon the nature of the project and how it is being funded, although I believe the majority of our programs that have reach the hardware stage, the project would also be coordinated in the Office of Assistant Secretary of Defense for Applications Engineering. This is not a completely separate coordination panel because there is joint membership between Applications Engineering and Research and Development on some of the committees. They each have some coordinating committees, I believe, that do not have overlapping membership.

Then, assuming that it has approval of Applications Engineering, if the OSD R. and D. office has primary responsibility, if funds are a problem, the project usually has to be coordinated with Assistant Secretary of Defense, Comptroller.

Mr. HAMILTON. Then what is the next step?

General PUTT. All of this leads up to the release or the approval for the use of funds to engage in the project.

Mr. HAMILTON. Who grants that?

General PUTT. The directive piece of paper would come from the Assistant Secretary of Defense, Research and Development.

Mr. HAMILTON. To whom would that be issued?

General PUTT. It would be issued to the Air Force. It is usually addressed to the Assistant Secretary of the Air Force for Research and Development, and comes down to the action office.

Mr. HAMILTON. Can the Assistant Secretary of Research in the Office of Defense, Office of the Secretary of Defense, actually release the funds?

General PUTT. No. The Comptroller always releases the funds.

DECISIONS AND RESPONSIBILITY

Mr. HAMILTON. Is that a purely formal business?

In other words after he gets his recommendations does he just automatically release the funds?

General PUTT. If everybody agrees, I think it is fairly automatic.

Mr. HAMILTON. Do you have any indication——

Senator SYMINGTON. Could I ask a question there?

The ultimate decision is made in the Office of the Secretary of Defense, probably in conjunction with the Assistant Secretary of Defense for Research and Development.

I don't quite know how it is set up now, especially after the latest recommendations under the Hoover report. But whoever is responsible for research and development takes it to the Secretary of Defense, who does or does not decide to accept it, with or without the advice of the Comptroller. Isn't that correct?

In other words, final decision in this matter, after it leaves the Air Force, is with the Secretary of Defense. Regardless of to whom he delegates, it is his decision; is it not?

General PUTT. I believe that is a fair statement; yes, sir.

Senator SYMINGTON. I am only trying to clarify the record. Some Secretaries of Defense, based on my experience, would reach decisions on the basis of information from the service involved, plus information from the person in charge of the research and development, and some on the basis of the opinion of the Comptroller.

In any case, regardless of how or where it is done, the decision, after it leaves the Air Force, is the decision of the Secretary of Defense. Is that correct?

General PUTT. You are referring to the Secretary of Defense as an office or as an individual?

Senator SYMINGTON. Yes; it is his responsibility.

General PUTT. It is his responsibility.

Senator SYMINGTON. To delegate it to whomever he wants to, verbally or in writing?

General PUTT. That is correct.

Senator SYMINGTON. But the rsponsibility is his responsibility?

General PUTT. That is correct.

Senator DUFF. In the final analysis it is his act.

Senator SYMINGTON. It is his act; yes.

General PUTT. Yes.

Mr. HAMILTON. Is that situation which you have described in general the one that is now in effect; that procedure I mean?

General PUTT. It is in everything except the ICBM and the IRBM.

Mr. HAMILTON. I thought, General, we were talking just about the ICBM and the IRBM. This representative illustrative procedure you have given us applies, does it not, to the ICBM and the IRBM?

Senator SYMINGTON. Could I ask there, if I may interrupt again, to delineate how, where or why in your opinion it does not apply to the ICBM or the IRBM?

General PUTT. Right, sir. I think the question that got me started on this procedure was related to what were the procedures in effect when the priority was first established.

Mr. HAMILTON. That is correct.

General PUTT. Yes, and what I have described are the procedures that were in effect when the program started.

Mr. HAMILTON. Pursuing Senator Symington's point, have those procedures been changed since then with respect to the IRBM and the ICBM?

PROCEDURAL CHANGES

General PUTT. Those procedures have been changed.

Mr. HAMILTON. About what time would that occur, approximately? You can supply the details for the record.

(The information requested has been supplied in classified form.)

General PUTT. It was about November 1955.

Mr. HAMILTON. Then what are the procedures that have been in effect since that time?

General PUTT. At the present time there are three groups—the best description is committees—one is the Scientific Advisory Committee to the Office of the Secretary of Defense, which is composed of scientific and technical consultants.

Senator SYMINGTON. Excuse me. Are they people who are outside of the Department of Defense?

General PUTT. They are, sir.

Senator SYMINGTON. Are they all civilians?

General PUTT. Yes; they are all civilians.

Senator SYMINGTON. Who chairs that committee?

General PUTT. Dr. Von Neumann has been the Chairman of the Committee.

Senator SYMINGTON. He has been ill, hasn't he?

General PUTT. He has been ill, and Dr. Millikin from California Institute of Technology has been the Acting Chairman.

Senator SYMINGTON. Dr. Millikin?

General PUTT. Clark Millikin.

Senator SYMINGTON. Dr. Clark Millikin is now the chairman, is acting chairman of that committee?

General PUTT. That is his title, Acting Chairman; yes, sir.

COMMITTEES

This committee reviews the technical program.

Mr. HAMILTON. Is that in the first instance as the technical program comes up as recommended to the Air Force it goes to this committee?

General PUTT. Essentially correct.

Then there is an Air Force Ballistics Missile Committee which is chaired by the Secretary of the Air Force, Mr. Quarles.

Senator SYMINGTON. Excuse me, the name of that is the Air Force Ballistics Missile Committee?

General PUTT. That is correct.

Senator SYMINGTON. Does that mean guided missiles of the Navaho type are involved in that committee?

General PUTT. No, sir; just the——

Senator SYMINGTON. Nonair breathers?

General PUTT. Nonair breathing, the ICBM and IRBM programs of the Air Force.

Senator SYMINGTON. Thank you.

General PUTT. Then there is the OSD Ballistic Missile Committee which considers the ballistic missiles programs of all three services, Army, Navy, and Air Force, ICBM and IRBM only.

Senator SYMINGTON. Will you repeat what you just said, please. This is getting pretty complicated to me.

What is that third committee? Rehearse that again; will you?

General PUTT. The third committee is the Department of Defense Ballistics Missile Committee which had been chaired by Assistant Secretary Robertson for the Secretary of Defense.

Senator SYMINGTON. He is Deputy Secretary?

General PUTT. I am sorry—Deputy Secretary. Since the appointment of Mr. Murphree, he is now the Chairman of that Committee.

Senator SYMINGTON. Who is on that Committee.

Senator DUFF. May I make a suggestion, Mr. Chairman?

Senator SYMINGTON. Yes.

Senator DUFF. For the purpose of clarification for the record and also for our information on this, would not it be a good idea to have the complete membership?

General PUTT. Yes; I can provide that for the record.

Senator SYMINGTON. Who is on this committee?

General PUTT. Murphree is the Chairman.

Senator SYMINGTON. What is on the Air Force Committee with Secretary Quarles?

General PUTT. With Secretary Quarles, the Assistant Secretary of the Air Force for Research and Development, General Brentnall, Assistant Secretary Sharpe, and I believe the Deputy Secretary of the Air Force, Mr. Douglas.

Senator SYMINGTON. In accordance with the request of Senator Duff, will you please furnish for the record here the chairman or/and temporary chairman or vice chairman of these three committees, and a complete list of the membership?

General PUTT. Right, sir.

(The information requested has been supplied in classified form.)

Senator SYMINGTON. Now could I ask what committee has the Army on ballistic missiles?

General PUTT. Perhaps we should ask the Army representative.

Colonel LAHATTE. I would prefer that we wait until our witness appears.

Senator SYMINGTON. This is just a question of fact. Just get it for the record.

Will you identify yourself again, Colonel?

Colonel LAHATTE. Lieutenant Colonel LaHatte, from the Office, Chief of R. and D.

Senator SYMINGTON. Colonel, what is the Committee on Ballistic Missiles, which is comparable to these other committees, in any way that has the Army interest.

Colonel LAHATTE. Yes, sir.

There is the Joint Army-Navy Ballistic Missiles Committee.

Senator SYMINGTON. And that is chaired by whom?

Colonel LAHATTE. That is chaired by the Secretary of the Navy.

Senator SYMINGTON. Of the Navy?

Colonel LAHATTE. Yes, sir.

Senator SYMINGTON. And who are the members of that Committee?

Colonel LAHATTE. I don't know them all, sir.

There is the Secretary of the Army, the Assistant Secretary of the Navy for Air, I believe.

Senator SYMINGTON. That would be Mr. Smith?

General PUTT. Yes, sir.

Senator SYMINGTON. Captain Searcy, could you help us on that?

Captain SEARCY. No, sir; I cannot.

Colonel LaHatte. Mr. Martin is the director of A. and D. of the Army.

Senator Symington. Mr. Martin, Director of Research and Development of the Army.

Colonel LaHatte. Yes, sir; and I do not know the others.

Senator Symington. Will you furnish a list of that Committee for the record?

Colonel LaHatte. This will be available.

Senator Symington. Do you know of any other committee, Captain Searcy?

Captain Searcy. No, sir.

Senator Symington. That would be in this general picture?

Captain Searcy. No, sir; this is way outside my field, Mr. Chairman.

Senator Symington. Now, Mr. Sprague, this is the first time I have heard of at least 2 of these 4 committees that I can remember—I ask at this point for the record if what we call in business an organizational chart can be furnised with respect to the duties of these committees; and also that that chart be broken into the normal breakup of structures first, and then function.

We should have a structure chart incident to each committee, and then a functional chart incident to each committee; and then a structural chart incident to the operation of the committees with each other; and then a functional chart incident to the operation of the committees with each other.

If we could have that for the record at this point it will be appreciated by the committee.

Mr. Sprague. Yes, sir.

Senator Symington. Senator Duff, does that meet with your approval?

Senator Duff. Yes, sir; I think that is very necessary in order to have a clarified idea of the whole picture.

Senator Symington. Thank you.

Will you proceed, Mr. Counsel?

(The information requested is as follows:)

Organization for Conduct of Ballistic Missile Program

The current organization for the conduct of the ballistic missile program is unique in several respects:

(1) It is a line-type organization not withstanding the apparent committee structure.

(2) It makes a maximum use of the current organizational structure within the Department of Defense by replacing a procedure requiring consecutive subdivision reviews with a procedure which provides simultaneous review and approval by the responsible top management personnel within the services and in turn within the Office of the Secretary of Defense if required.

(3) It has the ability to focus the attention of all responsible management personnel on trouble areas at each organizational level to make the necessary decisions to expedite the program.

In setting up this organization the advantages of a Manhattan District type operation with complete autonomy were considered. After review, it was believed that by proper organizational steps the same expedited consideration and direction of the program possible with a Manhattan District type operation could be achieved by use of appropriate parts of the current Department of Defense structure. Furthermore, the disruption of the existing ballistic missile program would be avoided and the time normally lost in formation of a Manhattan District type organization would largely be saved.

The current organization for conduct of the ballistic missile program is designed to have the capability of bringing any problem which may arise quickly to the attention of the organizational level necessary for final decision. Whereas under normal procedures it might be on the order of several weeks before a relatively minor but delaying problem at the contractor-service level can come to the attention of the Secretary of the service or, if necessary, the Secretary of Defense, it is now possible to bring it to the attention of these individuals in a matter of hours to a few days. Actions which formerly took months within the services and within the Office of the Secretary of Defense now are accomplished in a matter of days to a few weeks. Special attention has been paid to the problems of information handling and program direction to assure expedited consideration.

In order to make use of the existing background information available in related fields, such as the overall guided missile program, the organization has been tailored to bring in those people who also have cognizance of the overall program within the Department of Defense, to assure maximum utilization of all of our resources. By this approach it has been possible to foresee many potential interference problems, and by pertinent actions to remove the possibility.

To provide an adequate amount of technical guidance and at the same time avoid unnecessary interference to the program through frequent technical reviews, a topnotch scientific group with Dr. John von Neumann as chairman, has been selected to monitor the technical progress within the ballistic missile program. This group has complete access to all technological developments and is subject to call by the services as well as by the Office of the Secretary of Defense for technical program review and advice. Further review of the ballistic missile program in whole or in part has been specifically excluded from the technical areas of the many other consultant groups existing within the Department of Defense.

On the basis of the above philosophy the organization was set up in November 1955. Within the Office of the Secretary of Defense the review and approval authority for the entire ballistic missiles program was assigned to one group denoted the OSD Ballistic Missiles Committee (OSD–BMC). This group serves as the single point of contact between OSD and the services. The authority of the OSD Ballistic Missiles Committee is that of the Chairman who as a special assistant to the Secretary of Defense has review and approval authority for the overall ballistic missile programs. Pending the appointment of the Special Assistant for Guided Missiles, the Deputy Secretary of Defense acted as Chairman of the OSD Ballistic Missiles Committee during the period from November 1955 until April 1956. The membership of the OSD Ballistic Missiles Committee in addition to the Special Assistant for Guided Missiles as Chairman consists of the Assistant Secretaries of Defense most directly related with the conduct of this program. These are the Assistant Secretaries of Defense for Research and Development, Applications Engineering, Supply, and Logistics. Properties and Installations, and Comptroller. As such, each member is responsible for assuring that problems within their specific area related to the program receive prompt attention and that no delays are incurred. Since the members are also responsible for the normal Department of Defense programs in their respective areas conflicts are quickly removed and maximum utilization of the related effort is assured. It may be noted that the membership of the OSD Ballistic Missiles Committee also includes an Assistant Director of the Bureau of the Budget. It is the responsibility of this member to assure that problems which might arise within the Bureau of the Budget concerning the ballistic missile program are also resolved expeditiously. The members of the OSD Ballistic Missiles Committee are advisory to the Chairman, who has the authority to take direct action within the Department of Defense on all matters pertaining to this program.

The Air Force ballistic missile program consists of the ICBM No. 1, Atlas; ICBM No. 2, Titan, and the IRMB No. 1, Thor. To prosecute these programs the Air Force has provided a special organizational arrangement. Heading the Air Force management structure is the Air Force Ballistic Missiles Committee. The authority of this Committee is that of the Chairman, who is also the Secretary of the Air Force. Again as in the case of the OSD Ballistic Missiles Committee, members of the Air Force Ballistic Missiles Committee are those individuals within the Air Force directly concerned with the conduct of this program as well as related programs. The membership includes the Assistant Secretaries for Research and Development, Materiel, and Financial Management, and the Assistant Chief of Staff for Guided Missiles. Specifically included in

the functions of the Assistant Chief of Staff for Guided Missiles is the responsibility for serving as a focal point for consolidation of the Air Staff position with respect to conduct of the Air Force ballistic missile programs. In performing his functions, the Assistant Chief of Staff for Guided Missiles has access to all of the capabilities of the various elements of the Air Staff.

The principal operating organization within the Air Force for the ICBM Nos. 1 and 2 and IRBM No. 1 programs is the Western Development Division (WDD), located at Los Angeles, Calif., and an integral part of the Air Research and Development Command (ARDC). The commander of the Western Development Division, Maj. Gen. B. A. Schriever, is also deputy commander of the Air Research and Development Command for the Air Force ballistic missle programs. As deputy commander he has wide latitude in dealing with the various centers of the Air Research and Development Command which have support responsibilities for these programs. The arrangement also provides direct access to the Air Force Ballistic Missiles Committee for assistance or approval as may be required.

The Air Materiel Command (AMC) provides for the Western Development Division the direct support of its large industrial contracting organization. A special unit of the Air Materiel Command denoted the Ballistic Missiles Office has been physically located with the Western Development Division. The commander of the Ballistic Missiles Office is also the Deputy Commander of the Air Materiel Command for these programs, thereby assuring the full supporting effort by the Air Materiel Command.

The major technical support for the Western Development Division is provided by the Ramo-Wooldridge Corp. This corporation under prime contract to the Western Development Division provides technical direction and is responsible for the weapon system developments within the overall Air Force ballistic missile program.

The joint Army-Navy ballistic missile program has the objective of developing an intermediate range missile (IRBM No. 2, Jupiter) capable of being launched either from land or on board ship.

To prosecute this program the Army and Navy have jointly set up a special organizational arrangement. Heading the joint organization is the Joint Army-Navy Ballistic Missiles Committee. This committee again is patterned after the OSD Ballistic Missiles Committee with the authority that of the chairman and vice chairman of the committee, the Secretary of the Navy and the Secretary of the Army, respectively. Again those individuals within the services required to make major decisions in this as well as other program areas are members of the committee and are advisory to the chairman. The membership includes from the Navy, the Assistant Secretary of the Navy for Air; the Deputy Chief of Naval Operations (Fleet Operations and Readiness); Deputy Chief of Naval Operations (Air); Director of Guided Missiles, Office of the Chief of Naval Operations; and from the Army, the Director of Research and Development; Chief of Research and Development and the Director of Special Weapons, Office, Chief of Research and Development.

The principal operating organization within the Army is the Army Ballistic Missiles Agency (ABMA) located at Redstone Arsenal, Ala., and under the command of Maj. Gen. J. B. Medaris. This agency was specially created to provide a more direct management channel and its mission has two essential parts: First the development of an intermediate-range ballistic missile, IRBM No. 2, Jupiter, capable of being fired from either on land or from a ship, and second, to develop a complete intermediate-range ballistic missile weapon system which may be operated from on land. The commanding general of the Army Ballistic Missiles Agency has the authority delegated by the Secretary of the Army to call on all agencies within the Army for such assistance as required in the fulfillment of his mission. The arrangement also provides for direct access to the Joint Army-Navy Ballistic Missiles Committee for assistance or approval as may be required.

The major technical support for the Army Ballistic Missiles Agency and technical direction of the Jupiter program is provided by the German-American team of scientists and engineers who were formerly a part of the Redstone Arsenal technical team and have now become an integral part of the Army Ballistic Missile Agency staff.

To pursue its portion of the IRBM No. 2, Jupiter program, the Navy created a new operating unit called the Fleet Ballistic Missiles Office, located in Washington, D. C., and under the command of Rear Adm. W. F. Raborn. This unit has the responsibility for preparation and coordination of the Navy require-

ments for the Jupiter missile; and the adaptation of the Jupiter missile and procurement of the necessary shipboard equipment to make the Jupiter Shipboard weapon system. As the director of the Fleet Ballistic Missiles Office, Admiral Raborn has the authority delegated by the Secretary of the Navy to call on all agencies within the Navy for assistance as required in the fulfillment of his mission. The arrangement also provides for the direct access to the Joint Army-Navy Ballistic Missiles Committee for assistance or approval as needed.

Obviously such a joint arrangement as that existing between the Army and Navy requires very close coordination and cooperation by both services. In this regard several steps have been taken to assure a close working relationship: A joint secretariat with personnel from both services has been established for the Joint Army-Navy Ballistic Missiles Committee; extensive liaison channels have included the establishment of special working teams on specific problems in addition to regular liaison personnel; and finally the Chrysler Corp. has been selected as the prime missile contractor for both the Army and Navy portions of the Jupiter program.

General overall coordination and exchange of information among the three services is achieved through the established liaison channels between the three operating organizations: Army Ballistic Missiles Agency, Fleet Ballistic Missiles Office, and the Western Development Division. Each service has liaison personnel permanently stationed with the other operating units.

In consonance with the streamlined organization, and as mentioned earlier, one group of technical consultants, chaired by Dr. John von Neumann, and called the Scientific Advisory Committee, has been selected to provide technical review and advice on the conduct of the overall program. While sponsored by the office of the Secretary of Defense, the members of the Scientific Advisory Committee either individually or collectively are equally available to the services for technical advice or assistance in the conduct of their programs. This review mechanism also assists in the exchange of technical information since the presentations to and findings of the Scientific Advisory Committee are available to all key service personnel directly concerned in these programs.

(The chart outlining this organizational structure was filed with the subcommittee.)

Mr. HAMILTON. Yes, sir.

Who is General Schriever?

LINES OF AUTHORITY AND RESPONSIBILITY

General PUTT. General Schriever is the Air Force general officer who is commanding the Western Development Division which is that part of the Air Research and Development Command that is charged with conduct of the Air Force's ICBM and IRBM ballistic missile program.

Mr. HAMILTON. And to whom does he report, sir?

General PUTT. He reports directly to General Power, Commander of Air Research and Development Command.

Mr. HAMILTON. And General Power reports to you, does he, or to whom does he report?

General PUTT. The organizational chart shows he reports directly to the Chief of Staff, but I represent the Chief of Staff in the development field, and so one could say that he reports to me. But he can go direct to the Chief of Staff without seeing me.

Senator SYMINGTON. I must ask a question there.

Where does General Brentnall fit into this picture?

General PUTT. Shall I answer that?

Senator SYMINGTON. I think you had better.

Then we don't have to swear the general at this time.

General PUTT. General Brentnall is Assistant Vice Chief——

General BRENTNALL. Assistant Chief of Staff.

General PUTT. I am sorry, Assistant Chief of Staff for Guided Missiles. That covers everything, including research and development.

Another way of stating this, although I am not sure that it is exactly an accurate description, is that he is sort of vice president in charge of the coordination of all aspects of missiles within the Air Force.

That is the procurement, the production, the research development and training.

Mr. HAMILTON. Of all types of missiles?

General PUTT. And operations, of all types of missiles.

Senator SYMINGTON. Does that include ballistic missiles?

General PUTT. This includes ballistic missiles.

Senator SYMINGTON. Now General, will you see that a chart is furnished this committee at this point showing the relationship, structure, and function of General Schriever, General Power, General Putt, General Brentnall, and in turn their relationship to the Chief of Staff of the Air Force?

Will you furnish that for the record?

General PUTT. Yes, sir.

(The information requested has been supplied in classified form.)

Mr. HAMILTON. General, let us suppose that in connection with the work for which General Schriever is immediately responsible, a requirement develops for further research and development in connection with some aspect of the reentry problem; and let us suppose that he states that requirement for the use of funds that have already been appropriated for this purpose.

To whom does that requirement go in the first instance, to your office?

Then it goes first to General Power?

General PUTT. It goes first to ARDC Headquarters.

Mr. HAMILTON. Then where does it go?

General PUTT. As a matter of handling correspondence it would then come to General Brentnall's office.

Mr. HAMILTON. And from his office where would it go?

General PUTT. He would put it in the hands of whoever has the functional responsibility in the program.

For instance——

Mr. HAMILTON. Who would have the functional responsibility for reentry research and development projects?

General Putt. DCS/D.

Mr. HAMILTON. So that would come to you?

General PUTT. That is right, sir.

Mr. HAMILTON. Then do you review it? Does your staff review it?

General PUTT. We look at it just to the extent of assuring that it is in accordance with the development plan.

Mr. HAMILTON. Then after your office has approved it, where does it go?

General PUTT. It goes direct to the Air Force Ballistic Missile Committee chaired by the Secretary of the Air Force.

Mr. HAMILTON. And if that committee approves it then where does it go?

General PUTT. Then it has to go to the Office of the Secretary of Defense, Ballistic Missile Committee.

Mr. HAMILTON. At this point, does the Von Neumann committee have anything to do with it?

General PUTT. Here I guess I will have to describe the technique of operation of the Scientific Committee, Advisory Committee.

COMPLEX ORGANIZATION

Senator SYMINGTON. Take your time.

This is the most complicated piece of Government organization I have ever seen or heard of in my life. But it is the duty of this committee to try to understand it.

Therefore the Chair would like you and all the witnesses to take all the time you need to explain the function of these various committees.

Senator DUFF. If I might make a remark, Mr. Chairman, this set-up is almost as complicated as some of the problems you are trying to solve.

Mr. HAMILTON. That is just what I was thinking, sir.

Senator SYMINGTON. But I do think there are more people available, Jim, who can solve the problem of structure and function than are available to solve the ICBM or the IRBM.

General PUTT. I think this is probably a good observation. It may be the complexity of the problem that causes the complex organization partially.

Senator SYMINGTON. This is not necessarily criticism on my part. I am just saying it is the most complicated organizational structure I have ever heard of before, either in business or in government; and therefore you take your time in explaining it.

Mr. HAMILTON. You were speaking of where the Von Neumann committee entered the picture.

General PUTT. Yes; and I believe we would save time and clarify the whole thing if I described or named the three committees, scientific advisory committee, the Air Force Ballistic Missile Committee, and the OSD Ballistic Missile Committee.

I think it would be best if I now outlined the procedure.

General Schriever and the Western Development Division prepare what we call a development plan.

This outlines what research and development has to be done, it outlines schedules of when certain significant events have to be initiated, when works has to be completed so that all the bits and pieces will be integrated into a complete system when we come to the end of the line.

They have to determine what test facilities are going to be required to carry out this research program.

They have to cost all of the work; the research and development.

Senator SYMINGTON. Who do you mean by "they"?

General PUTT. This is the Western Development Division, General Schriever's organization. He develops a complete development plan for the development of the ICBM. I specifically say ICBM at this point. The procedure is the same for both the ICBM and IRBM, but each would have a different development plan as a separate document.

This development plan will cover everything that is required, facilities, manpower, funds, research and development work to be done, everything we can think of.

Mr. HAMILTON. General, is that only done once for the whole ICBM program, because the illustration I was using was with respect to a particular aspect of it?

General PUTT. Yes.

Mr. HAMILTON. This plan you are talking about relates only to the overall program?

General PUTT. Yes, but it is pretty detailed.

Mr. HAMILTON. I understand that.

General PUTT. Right. It takes up the development program for each of the components like the propulsion system and so on and so forth.

Mr. HAMILTON. I understand that.

General PUTT. This plan now is submitted to the Air Force's Ballistic Missile Committee, first the plan having been reviewed by the Scientific Advisory Committee for its technical completeness and whether it makes sense technically.

Senator SYMINGTON. Now what Scientific Advisory Committee is that?

Mr. HAMILTON. Is that the Von Neumann committee?

General PUTT. That is the Von Neumann committee.

Senator SYMINGTON. Let me get this straight.

You have an organization called the Western Reserve what?

General PUTT. Western Development Division of the Air Research and Development Command.

Senator SYMINGTON. The Western Reserve Division of the Air Research and Development Command, which from here on we call the Western Reserve Division, all right?

General PUTT. Western Development Division—WDD.

Senator SYMINGTON. O. K.

Now you have the Western Development Division and they get an idea, but before that idea goes any further in the Air Force, it bypasses the Air Force in effect and goes to an advisory committee to the Secretary of Defense.

Is that what you have just said?

General PUTT. I guess the answer to that is that this committee, the Scientific Advisory Committee, is really serving two purposes. It reviews——

Senator SYMINGTON. I am not talking about purpose, I am talking about function.

General PUTT. Right. It is serving a function for the Air Force and a function for the Department of Defense.

Senator SYMINGTON. Well, but you have to locate authority somewhere, even if it is only for the particular function that we are talking about.

Now when the committee, the Western Development Division under General Schiever who reports to General Power, now what is General Power's title?

General PUTT. He is Commander of the Air Research and Development Command, of which the Western Development Division is one of his components.

Senator SYMINGTON. And where is he stationed?

General PUTT. Baltimore.

Senator SYMINGTON. Does the Western Development Division bypass General Power in order to get to the Scientific Advisory Commission?

General PUTT. No, sir.

Senator SYMINGTON. Or does General Power approve whatever it is that General Schriever wants to do?

General PUTT. In practice that is about what happens.

Senator SYMINGTON. We don't want to know "about" what happens. We want to know what is the practice.

General PUTT. General Schriever wears two hats in effect. In addition to being a commander of the Western Development Division, he is also a deputy commander to Power, so in this instance he can represent General Power in carrying the development program to the Scientific Advisory Committee.

Senator SYMINGTON. But he could also, if he wears two hats, bypass General Power and go directly to the Scientific Advisory Committee?

General PUTT. This is correct.

Senator SYMINGTON. Does he do that occasionally?

General PUTT. I think he does, depending upon the nature and the character of the problem.

Senator SYMINGTON. And when he goes to the Scientific Advisory Committee, which at this time is chaired by Dr. Clark Millikin——

General PUTT. Right, sir.

Senator SYMINGTON. That committee also wears two hats as I understand it, because although it actually reports to the Secretary of Defense, as your previous testimony said, it also reports to the Air Force ?

General PUTT. It reviews the development plan and submits its advice.

Senator SYMINGTON. When it does that it is functioning as an advisory body subject to the approval of the Secretary of Defense, is it not?

General PUTT. Yes.

Senator SYMINGTON. Now if that is true, suppose the Scientific Advisory Board under Dr. Millikin does not believe in the idea of the head of the Western Development Division. It dies there, doesn't it?

General PUTT. No; I don't think it dies there because the Scientific Advisory Board only has advisory function.

It does not have approval or authority function.

Senator SYMINGTON. So what then is being done when it is given to the Scientific Advisory Board by the Western Development Division as step No. 1, with the possibility of the step being step No. 2 depending upon whether General Schriever takes it up with General Power, is a request for advice and not a request for decision, is that correct?

General PUTT. To General Power?

Senator SYMINGTON. No.

Let me repeat. If General Schriever decides to bypass General Power, the first step would be a request from the Western Development Division of the Scientific Advisory Board of the Department of Defense.

Would that be a request for opinion or a request for decision?

General PUTT. Opinion and advice only.

Senator SYMINGTON. Opinion and advice only.

General PUTT. Yes, sir.

Senator SYMINGTON. And that opinion and advice presumably therefore would go back to General Schriever?

General PUTT. That is correct.

Senator SYMINGTON. Or would it go somewhere else?

General PUTT. No; it goes direct to Schriever.

Senator SYMINGTON. It would not go anywhere else?

General PUTT. I believe not.

Senator SYMINGTON. Then what would General Schriever do?

General PUTT. He weighs this advice, and if in his opinion and the people working for him any changes are necessary in this plan the changes would be made.

Senator SYMINGTON. Would he do that on the basis of his own authority or would he ask for additional authority in order, for example, to carry out something where he did not agree with the advice given him by the Scientific Advisory Commission.

General PUTT. He has the authority to make such a decision.

Senator SYMINGTON. Himself?

General PUTT. He has.

Senator SYMINGTON. Without any further authority from his superiors?

General PUTT. You see at this point in the procedure as I am describing it, he is merely developing the plan which has not yet been approved, you see.

Senator SYMINGTON. Yes.

General PUTT. I can see where I am getting you a little confused.

Senator SYMINGTON. That is all right. I think I am clear.

Now you go ahead. What does he do from then on?

General PUTT. Let's assume that he has now completed what he considers to be the best possible plan for the development of the ICBM.

PROCEDURE FOR ICBM PLAN

He has a document labeled "Development plan weapons system 107A."

He now submits this to General Power and through General Brentnall's office.

Senator SYMINGTON. And then what?

General PUTT. Through General Brentnall's office.

Senator SYMINGTON. Through General Brentnall's office?

General PUTT. That is right.

Senator SYMINGTON. So even though he reports to General Power he clears through General Brentnall?

General PUTT. This is an administrative procedure for keeping track of the correspondence and action and so on and so forth.

Senator SYMINGTON. Who does General Brentnall report to?

General PUTT. Chief of Staff.

Senator SYMINGTON. So on a question of General Schriever's work, the Western Development Division to contact this direct superior—and I am only asking for information—there is no criticism involved in these questions at all, I am just trying to get the structure clear and the functioning under it—to contact or work with his direct

superior on ballistic missiles, is that all the Western Development is interested in, the ballistic missiles and other missiles?

General PUTT. Yes; the ballistic missile is all they have.

Senator SYMINGTON. They have not got guided missiles in any way.

General PUTT. No.

Senator SYMINGTON. So in ballistic missiles he clears through General Brentnall on a plan?

General PUTT. To Brentnall—that is correct.

Senator SYMINGTON. To Power, and then what happens?

General PUTT. No, no, the other way around. From Power to Brentnall.

Senator SYMINGTON. Oh, I thought you said he cleared with General Power through General Brentnall.

General PUTT. No.

Senator SYMINGTON. I beg your pardon, now I am clear, I did not understand that. It goes from General Power and General Power sends it to General Brentnall.

General PUTT. That is correct. The development plan then is reviewed by the Air Force's Ballistic Missile Committee which is chaired by the Secretary, Mr. Quarles.

If that Committee, the Air Force's Ballistic Missiles Committee, approves the development plan as submitted by General Schriever, the development plan then is forwarded to the Ballistic Missile Committee of the Office of the Secretary of Defense, chaired by Mr. Murphree, recommending approval of the development plan as submitted.

Senator SYMINGTON. Now at this point will you give us a practical illustration, the thought behind the definition of the plan—of the word "plan."

General PUTT. The development plan?

Senator SYMINGTON. Yes.

General PUTT. This is a statement, a rather voluminous statement, of the work that has to be done, the resources that are required in facilities, manpower, equipment, and the funds that would be required to finance such a program.

Senator SYMINGTON. Are you talking about a new program or a major engineering change?

General PUTT. No; this is the total program from beginning to end to develop the ICBM.

Senator SYMINGTON. But you already have a total program from beginning to end to develop the ICBM in the development of the Atlas.

I do not want to labor this but it is mighty important. Let's take a piece of paper, and follow that paper.

Suppose a major engineering change was submitted by somebody, an outside inventor, a contractor, an engineer in the Air Force, or one in another service.

Suppose that is submitted to General Schriever, this major engineering change.

I don't want to just tie it in to some completely new program, because that does not give us a real picture of function.

Now suppose that engineering change comes to General Schriever, some major engineering change, as for example, a better reentry design, and General Schriever thought this suggested design change, plus covering information, was worthwhile.

What would be the next thing he did?

General PUTT. It was to be able to answer that kind of a question that I was developing the procedure for establishing the approval of the overall development plan which then defines General Schriever's authority to act on such an item.

Senator SYMINGTON. All right; and you have it now to where it goes before the Ballistic Missiles Committee of Mr. Murphree.

General PUTT. Of Mr. Murphree. If he now approves, if his committee approves the overall development plan for the ICBM, this, then, becomes General Schriever's authority to proceed with the contracts and whatever action is necessary to develop the ICBM.

This then gives him the authority to take such action as you have just described, provided that such recommendations for changes that have been submitted to General Schriever fall within this broad development plan.

Now if it does not, if it is something that by analysis would be something quite different, and would fall outside of the approved plan such as we now have with Convair building the Atlas ICBM and Martin building ICBM No. 2, known as Titan. For example, supposing North American came in and said, "We want to get into this act, too, and we want to build a missile known as Comanche." This would be outside of General Schriever's authority, and he could not initiate another ICBM project.

Now if it is an engineering change to the Atlas missile or to the Martin type of missile, as long as the characteristic of the missile and its performance, I mean its military characteristics, not how fast or how far it will go, but its military characteristics are not altered, and if there are not significant or large dollar changes, he has the authority to go ahead and do it.

Senator SYMINGTON. Perhaps this would clear me up.

The counsel in an aside mentioned the fact that you have a new ICBM program every 6 months.

REEXAMINATION OF PLANS

Mr. HAMILTON. The kind of planned program you have been talking about, the comprehensive plan. I understood you to say you had that when you started, and then it was reviewed and went through this process every 6 months; is that correct?

Senator SYMINGTON. In other words, here is what I am trying to get at.

You have illustrated something for a new ICBM contract, but you only have one ICBM contract.

General PUTT. Right.

Senator SYMINGTON. You have one IRBM contract.

We don't want to see something that just flows once through this organizational structure you have drawn.

We want to see how it flows in function day to day. Do you follow me there?

General PUTT. Right, sir.

Senator SYMINGTON. In other words, what is the function under this structure?

General PUTT. We revise it——

Senator SYMINGTON. So it is not a new plan. It is a revised plan. It is a look at the old plan?

General PUTT. That is right.

Senator SYMINGTON. And then a decision is made based on how to implement further the old plan?

General PUTT. That is right. The more you do, the more firm your plans for the next succeeding period of time become, so we revise the plan to reflect that increased sharpness that one can now put into the plan.

That is what I meant by we review the plan every year to make sure.

The program, of course, is under continuous review to make sure you are meeting deadlines, or if you have been lucky and gotten ahead of schedule in some areas then you want to revise the rest of the program to match.

MODIFICATIONS IN PLAN

Senator SYMINGTON. Now I want to ask one more group of questions.

Suppose that an engineer at Martin who had an IRBM program called Titan develops a major improvement in reentry or guidance or propulsion, and he brings that to General Schriever, and when I say "major," I mean a major program of improvement which nevertheless General Schriever feels definitely comes within what has been staked out. Can Shriever make the decision that said improvement be incorporated into the development, or does he have to talk to somebody; and if so, to whom?

General PUTT. If the change does not require a significant increase in the funds required, and then, as you have stated, it falls within the development plan, he does have the authority to incorporate it into the missile program.

He may choose, depending upon how competent he feels to evaluate this technical improvement or how capable he feels his staff is to evaluate it, he may choose to call in the Scientific Advisory Committee.

But he has the authority to make this decision.

If in his interpretation he is not sure whether this falls within the bounds of what has been approved in the development plan, or if more dollars are required, then again it has to come to the Air Force Ballistic Missile Committee, to the OSD Ballistic Missile Committee for approval.

Senator SYMINGTON. Is the only place that he would go for advice a committee outside of the Air Force?

Suppose, for example, he believed that this idea was a good one and should be incorporated, but he was not satisfied to rely on his own technical knowledge, because of the nature of the suggested improvement.

Is there any other place within the Air Force he could go for advice, or would he go invariably to this Scientific Advisory Board in the Department of Defense?

General PUTT. He has available to him any of the resources of the Air Force, particularly in the Air Research and Development Command, to go for advice. In fact, I can think of no limitation on where

he can go to get such advice as he needs, and it is not limited to the Scientific Advisory Committee established for that specific purpose.

Senator SYMINGTON. I am clear. Thank you.

Mr. HAMILTON. Senator Duff?

Senator DUFF. I was just going to say, am I correct in believing that the total of the activities included within these brackets, that the purpose of the general overall plan is to keep them always correlated and in proper perspective not only with what you intend to do, but other things that come in to keep them correlated in perspective with the overall plan?

General PUTT. That is correct.

This is a very difficult scheduling problem.

There are so many contractors in the project, and all of their work has to be very carefully scheduled and kept track of to make sure that it is proceeding.

Senator SYMINGTON. Could I ask this question?

Excuse me, Senator Duff.

Senator DUFF. That is all right; that is what I wanted to know.

Senator SYMINGTON. You talked about his staff.

Is there a scientific advisory committee in the Western Development Division?

What is his staff?

ADVISORY ASSISTANCE

General PUTT. Well, he has a staff that is composed of military, mostly technically qualified officers, Air Force officers.

There are some Air Force civilians that are assigned to his office and, in addition, on contract with the Ramo-Woolridge Corp., they provide scientific and technical personnel to assist Schriever in the discharge of his duties as commander of the Western Development Division.

Senator SYMINGTON. Do they produce anything?

General PUTT. They do not produce any hardware that is associated with the ICBM or IRBM program.

Senator SYMINGTON. So they really are under contract for advice?

General PUTT. For advice. You might call it the contractual staff.

Senator SYMINGTON. Suppose they do not give any advice because they are not asked. Do they still get paid?

General PUTT. They are working mighty hard.

Senator SYMINGTON. They are always giving advice; is that it?

General PUTT. Yes; technical advice. In the operation of General Schriever's office in the day-to-day operation, there is no distinction between contract and assigned personnel. It is all his office.

Senator SYMINGTON. Does General Schriever delegate technical authority to Ramo-Woolridge in addition to advice? In other words, can they tell a manufacturer how to make a part?

General PUTT. Well, Schriever is the final authority.

Senator SYMINGTON. Does he delegate that authority to them in any case?

General PUTT. I don't believe I can answer that.

Senator SYMINGTON. Will you find out for the record whether they can change a print, for example, in a design; whether that is delegated to them; and, if so, under what circumstances?

General PUTT. Right.

(The requested information has been supplied in classified form.)

Senator SYMINGTON. There has been some criticism of engineering contracts. I want to emphasize that this is no part of the Chair's thought in this matter.

What we want here is to get the lines of authority and responsibility incident to a development which many people feel is perhaps the most important item to the free world that is in development at this time.

General PUTT. Surely.

Mr. HAMILTON. Senator, if I may interrupt, we have a legal problem. Senator Duff left. We are entitled to proceed with a quorum of 1 under the rules only if there has been 48 hours' notice.

Senator SYMINGTON. I imagine we can still have the——

Mr. HAMILTON. We can take it and, if everybody agrees, introduce it in the record technically.

Senator SYMINGTON. I have asked questions on this chain of command——

Mr. HAMILTON. I might just note for the record that I understand the notices for General Putt's appearance were sent out more than 48 hours in advance of his appearance, so we are in compliance.

General PUTT. In answer to your question, General Schriever has the final responsibility, but I do not know what day-to-day working relationships exist between him and the Ramo-Woolridge personnel.

Senator SYMINGTON. Will you find out for us?

General PUTT. Right, sir.

(The information requested has been supplied in classified form.)

Senator SYMINGTON. One document could clear that up.

Mr. Counsel, will you proceed?

Mr. HAMILTON. Yes.

FREQUENCY OF REVIEW OF PLAN

I would like to clear up one minor point, General. I had the impression that these general reviews of the plan, the comprehensive plan of the ICBM, were made at 6-month intervals

I gather from what you say that is not correct. They are made on an annual basis.

General PUTT. This is my understanding. However, am I correct, that——

Mr. HAMILTON. The are made on an annual basis.

General BRENTNALL. Can I speak off the record, since I am not sworn?

Senator SYMINGTON. Let's put it on the record.

General Brentnall, will you raise your right hand?

Have you got anybody here who might testify with you?

We can do it all at the same time.

General BRENTNALL. Yes, sir; General McCorkle.

Senator SYMINGTON. Do you swear that you will give to this subcommittee on the Air Force of the Senate Armed Services Committee the truth, the whole truth and nothing but the truth so help you God?

General BRENTNALL. I do.

General MCCORKLE. I do.

General BRENTNALL. I think perhaps where General Putt got the 6-month idea, the first comprehensive plan was submitted in November.

Mr. HAMILTON. Of what year?

General BRENTNALL. Of 1955.

It was reviewed and presented again in March of 1956. This plan is constantly, what I would term, adjusted.

A new program is scheduled for I think the 1st of October of 1956 to carry on the plan that will incorporate the funds which we are asking for fiscal 1957.

I don't think there is any specific 6-month period involved. If something new, such as you brought out, would occur and was approved, the plan would be revised or adjusted whenever that occurred.

I don't think—what I am trying to say—that 6 months is a magical time date.

Mr. HAMILTON. May I just ask one question for clarification, General Brentnall.

Am I correct in my understanding that the first comprehensive plan of the kind that General Putt has testified to that went through the procedure that he has testified to was a plan that was formulated, was it formulated in November of 1955?

General BRENTNALL. It was submitted.

Now how long it was in formulation I do not know.

Mr. HAMILTON. That is an improvement on my question, thank you. It was submitted in November of 1955 to whom?

General BRENTNALL. The Air Force Ballistic Missile Committee.

Mr. HAMILTON. And started through the process?

General BRENTNALL. Yes, sir.

Mr. HAMILTON. Then am I correct that a comprehensive revision of that plan was submitted for review to the same committee in March of 1956?

General BRENTNALL. That is right.

Mr. HAMILTON. And then am I correct that it is contemplatd that a comprehensive revision of the March 1956 plan will be submitted to the same committee for review in October of 1956?

General BRENTNALL. Yes, sir; that is right.

Mr. HAMILTON. Thank you.

Senator SYMINGTON. General Brentnall, is there any major or minor aspect of General Putt's testimony—you and he in effect are partners in this operation—that you would like to bring up at this time for clarification?

General BRENTNALL. None that I have heard, sir.

The only suggestion I might make is in this interhouse play between General Schriever and the Ramo-Woolridge Corp. that you ask General Schriever to come and give it to you. I think he is expecting to tell you about it at any time.

Senator SYMINGTON. Do you expect him to be a witness?

Mr. HAMILTON. We will be glad to.

General BRENTNALL. I think from the horse's mouth the testimony is far more effective.

Mr. HAMILTON. All we want to do is get the structure generally and then fill it in.

Senator SYMINGTON. From all I have heard, General Schriever has done a fine job. Again may I emphasize that we are not interested in anything but getting the structure and the functions incident to the various services' positions on the missiles; and then we will try to see how they mesh.

Mr. HAMILTON. In addition to this comprehensive plan that you have talked about, General Putt, have there been any other matters within the plan, any changes in the plan once we reviewed or any changes in the program that have gone through this procedure since it was started in November 1955 through this structure of committees?

General PUTT. I probably won't be able to name them specifically but I do know that there have been some facility proposals that have been processed through the committee for the final program.

Mr. HAMILTON. I wonder if you could supply those for the record and a brief description of them?

REVIEW TIMING

Now, turning to the submittal that was made in November of 1955, how long did it take to get that reviewed by the various committees, approximately?

If you don't know, you can supply it for the record.

General PUTT. We had better supply it for the record. (The information requested has been supplied in classified form.)

Mr. HAMILTON. I would like to have the same information supplied please with reference to the submittal initiated in March 1956.

Senator SYMINGTON. Is General Musgrave here?

General ROUSE. No, sir, he is not.

General SYMINGTON. You are representing him, sir?

General ROUSE. Yes, I am.

Senator SYMINGTON. On some of these items, where they can be supplied fairly rapidly, we would appreciate being supplied fairly rapidly, so they can be incorporated in the record at the earliest possible time.

General ROUSE. Yes, sir, we will provide them.

Senator SYMINGTON. On items not classified, let's get them as soon as we can.

(The requested information has been supplied in classified form.)

DEPARTMENT OF DEFENSE DIRECTIVES

Mr. SPRAGUE. The various directives that relate to functions of research and development and special assistance for guided missiles, for missiles in the Office of the Secretary of Defense will be provided.

Senator SYMINGTON. That at this time would be for the Office of the Secretary of Defense and the Air Force, plus the relationship of the Air Force to the Office of Secretary of Defense; and later on, at the proper part of the record, we will do the same for the other services.

ACCELERATION OF ICBM PROGRAM

Mr. HAMILTON. General, directing your attention to the time period prior to November of 1955, do you recall, am I right in my recollection of your testimony that the Air Force recommended that the ICBM be given first priority in October of 1954?

General PUTT. In May of 1954 the ICBM project assumed highest Air Force priority.

Mr. HAMILTON. You mean it was then given highest Air Force priority?

General PUTT. Within the Air Force.

Mr. HAMILTON. Within the Air Force. And what activity had preceded that in the Air Force, say from 1950 onward?

General PUTT. Well, all of our work from 1945 on had preceded that in ballistic missiles.

Mr. HAMILTON. And what were the events that led up to the Air Force giving the ICBM the highest priority in May of 1955?

General PUTT. I think it was the review of the Strategic Missiles Evaluation Committee, that was Mr. Gardner's committee.

Mr. HAMILTON. And during what period did that committee function?

General PUTT. That was in 1953. The report of the committee was submitted in February 1954, and then in March 1954 there was a memorandum from the Secretary of the Air Force to the Chief of Staff directing acceleration of the ICBM.

Mr. HAMILTON. Could we have a copy of that memorandum supplied for the record.

(The information requested has been supplied in classified form.)

Mr. HAMILTON. Now following the directive from the Secretary of March 1954, what did the Air Force do to implement that directive, in a general way?

What step did you take?

EFFORTS TO STREAMLINE PROCEDURES

General PUTT. I think the most significant step was probably our efforts or our actions to streamline as much as we could within the Air Force our procedures for handling this project and at least started the organization of the Western Development Division.

Mr. HAMILTON. This is beginning in March of 1954?

General PUTT. It would have been, it followed——

Mr. HAMILTON. Following the March 1954 directive?

General PUTT. That is right.

FUNDS TO IMPLEMENT PRIORITY

Mr. HAMILTON. Now then what funds did you have available during the fiscal year of 1954 to apply for this purpose approximately and if you don't have them, supply them for the record.

General PUTT. I would like to reserve the right to make sure these are correct, but my record here shows that in fiscal year 1953 we had $3,200,000.

Mr. HAMILTON. For fiscal 1954?

General PUTT. That was fiscal year 1953.

Mr. HAMILTON. Is that just from research and development funds of the kinds you have talked about or funds from all sources?

Why don't you supply it for the record?

General PUTT. I think we had better.

It turned out that the only funds in the project at that time were research and development funds. There were no other funds.

Mr. HAMILTON. What year was this now?

General PUTT. 1953.

Mr. HAMILTON. And how much money did you have to spend?

General PUTT. $3,200,000.

Mr. HAMILTON. Now then for fiscal year 1954, and if they are not readily available just supply them.

General PUTT. I think I have them here.

In 1954 there was $20,783,000.

Senator SYMINGTON. Fiscal 1954?

General PUTT. Fiscal 1954. That is roughly half and half research and development funds and procurement funds.

Mr. HAMILTON. The 20 includes funds from both sources?

General PUTT. That is correct.

Mr. HAMILTON. Then what did you ask for for the ICBM in fiscal 1955?

General PUTT. That I will have to supply for the record.

(The information requested has been supplied in classified form.)

Mr. HAMILTON. Can you tell us how much was spent in fiscal year 1955 in the development of the ICBM from all sources?

General PUTT. In fiscal year 1955, it is 179,575,000.

Mr. HAMILTON. And was that sum of money only from research and development funds of the kind you have testified or was it funds from all sources?

General PUTT. That is funds from all sources and out of research and development funds there was $20,100,000.

Mr. HAMILTON. During fiscal 1955 were your funds adequate?

NO RESEARCH AND DEVELOPMENT FUND LIMITATION ON ICBM 1955–56

General PUTT. There was no fund limitation in 1955.

Mr. HAMILTON. No fund limitation in 1955?

General PUTT. No, sir.

Mr. HAMILTON. Turning to fiscal year 1956, could you give us the figures on that?

General PUTT. Figures show here $421,880,000, of which $20 million are from research and development.

Mr. HAMILTON. And during fiscal year 1956 was the program limited because of funds?

General PUTT. No, no limitation.

Mr. HAMILTON. And what are the figures with respect to proposed expenditures in 1957, if you have them?

General PUTT. Fiscal year 1957, the President's budget includes $582,843,000, of which $24,241,000 are research and development funds.

Mr. HAMILTON. Is that the amount that was requested by the Air Force?

General PUTT. I am certain this is the amount that was requested.

Mr. HAMILTON. So that you don't anticipate that you will be limited by funds in 1957?

General PUTT. No.

PROCEDURE

Mr. HAMILTON. Now turning back again to the period commencing with the Secretary's directive of March 1954 to give the ICBM top priority in the Air Force, General, what was the procedure then in effect with respect to the manner in which your program or the measures that you took to implement this directive were reviewed before they were put into operation?

General PUTT. They would have been the same procedures that I described earlier this morning when we were talking about what was

the procedure for the ICBM before the establishment of the two committees plus the scientific advisory committee.

Mr. HAMILTON. Could you just state briefly in order what the succession of those would be?

General PUTT. Yes. The Air Force having decided that it was first priority, any request for additional funds or change in emphasis on the program would be submitted to the Assistant Secretary of Defense for Research and Development, Assistant Secretary of Defense applications engineering, particularly if there were any—no, I don't believe there were any procurement funds involved, so if there were not it would not go on to the Assistant Secretary of Defense applications engineer.

After the Assistant Secretary of Defense, research and development, had coordinated with the Comptroller, the program approved, it would then be returned to the Air Force and we would be able to proceed within the limits of the plan or the program as had been approved by the Secretary of Defense.

PROCEDURES UNSATISFACTORY

Mr. HAMILTON. Was the situation from the standpoint of administration between May of 1954 when the Secretary of the Air Force issued his directive to give it the top priority and November of 1955 when as I understand it the first plan was submitted under the new procedure, were the administrative procedures during that period satisfactory?

General PUTT. I would say they were not satisfactory because——

Mr. HAMILTON. What were the problems or the circumstances that made them unsatisfactory?

General PUTT. The length of time that it took to conduct the various reviews by the coordinating committee, the technical advisory panel if they were involved, just the procedures, administrative procedures were too lengthy.

Mr. HAMILTON. Can you give the committee any examples of the kind of difficulties that were encountered as a result of that situation?

General PUTT. Well, one just does not get on with the program as fast as one would like to do it.

It is a time delay, is the effect.

Mr. HAMILTON. Now this was a period that ran from March of 1954 as I understand it, and don't let me put words in your mouth in this connection, General, but as I got the impression from the dates, and if I am wrong correct me—this period existed from March of 1954 when the Secretary of the Air Force issued the directive saying the ICBM should have top priority, until November 1955, when the first plan was submitted under the new procedure; is that right or wrong, in general?

General PUTT. It existed up until the establishment of the new committee structure, and I believe this was some time in November of 1955.

Mr. HAMILTON. That is a period of approximately 19 months?

General PUTT. Yes.

Mr. HAMILTON. About a year and a half.

General PUTT. About a year and a half. It did not seem that long.

Mr. HAMILTON. Now would you regard the delays that occurred during that period as being substantial, significant?

General PUTT. I don't believe I could answer that unless I could go back and actually analyze it. When you say are they significant or not, I would have to analyze what some of the specific——

Mr. HAMILTON. Could you do that and give us your appraisal of the consequences?

General PUTT. I can try.

(The information requested has been supplied in classified form.)

PRIORITY RATING RELATIVE TO PRIORITY ACTION

Senator SYMINGTON. When did the Air Force decide that the ICBM should have highest priority?

General PUTT. Highest priority? That was May 14, 1954.

Senator SYMINGTON. When did you receive that approval from the Secretary of Defense, that it would have highest priority?

General PUTT. Within our own resources we could take that action. Within such resources as were available within the Air Force, we could do this.

Now any additional funds that were required to emphasize the priority would have had to have gone to the Secretary of Defense Office.

Senator SYMINGTON. What you are saying is that when you decided it was the highest priority, you were hungry?

General PUTT. Yes.

Senator SYMINGTON. So you ate all the food that you had.

Now when was it decided also that it was the highest priority by the people who could give you the additional food?

Presumably you were still hungry. You still thought it was the highest priority.

General PUTT. I suppose one could relate that to the establishment of top national priority by the NSC.

I do not believe that is exactly the——

Senator SYMINGTON. Can't you relate it to something like funds; or if not funds, a directive of approval?

In other words, when was it agreed that your additional food to satisfy your hunger was to be forthcoming on the basis of highest priority?

General PUTT. I would have to re-search the record.

Senator SYMINGTON. Will you do that, General, and put it in? Thank you.

(The information requested has been supplied in classified form.)

Mr. HAMILTON. Senator, I believe, under the arrangement we have when Senator Duff left, Mr. Rhodes can put questions in their stead, if you gentlemen have some questions now on the ICBM this might be the opportunity or occasion to ask them because I intend to turn now to the IRBM.

Senator SYMINGTON. Fine.

Mr. Rhodes, at this time do you have any questions you would like to ask for the record?

GARDNER COMMITTEE

Mr. RHODES. Yes, I would just like to follow up the point you were making, if I may, with the formation of the Gardner committee in the spring of 1953, I believe you said.

General PUTT. That is correct.

Mr. RHODES. Was the formation of this committee generated in any way by adverse intelligence reports concerning Soviet progress, or was it the desire of the Air Force to get on with this program?

General PUTT. The Gardner committee was organized at the initiation of the Office of the Secretary of Defense to review all missile projects. To my knowledge—well, I don't know whether there was any Russian intelligence that sparked that or not.

Senator SYMINGTON. Any further questions?

Mr. RHODES. No.

Senator SYMINGTON. Mr. Counsel?

Mr. HAMILTON. Not on the ICBM.

Senator SYMINGTON. I have no further questions at this time.

Will you proceed then.

NO FUNDS FOR IRBM UNTIL FISCAL YEAR 1956

Mr. HAMILTON. Turning your attention now to the IRBM, General, when did the Air Force first start substantial work on the IRBM?

General PUTT. Although the Air Force had stated a requirement and had carried it in our program, the first funding on the program was not until fiscal year 1956.

Mr. HAMILTON. Fiscal 1956.

How long had you been carrying it in your program and stating a requirement for it?

General PUTT. Somewhere between 2 and 3 years.

Mr. HAMILTON. What does that mean, that you had asked for funds for it or that you had not asked for funds for it?

Don't let me put words in your mouth.

Senator SYMINGTON. That is very important.

Mr. HAMILTON. What does it mean?

Senator SYMINGTON. May I interject here?

When is the first year, or day, in any case, year, that you asked for funds for the IRBM?

General PUTT. I would have to go to the record, Mr. Chairman.

Senator SYMINGTON. Have you got it here?

General PUTT. I will have to get it.

Senator SYMINGTON. Proceed, Mr. Counsel.

Mr. HAMILTON. And when was the first year in which you got any funds for the IRBM?

AIRFORCE MOVED SLOWLY IN IRBM

General PUTT. 1956 is the first year that we at least applied any funds to this area.

In our program it showed up first as a tactical ballistic missile rather than the present name of the intermediate range missile.

Senator SYMINGTON. Is Douglas making your IRBM?

General PUTT. Yes.

Senator SYMINGTON. What is the date of the contract on that?

General BRENTNALL. It was about Christmas of 1955.

General PUTT. We can supply the accurate date but it was late last year.

General BRENTNALL. Late December.

General PUTT. December 1955.

Senator SYMINGTON. And then you will supply the date of, you might say, the origin of Air Force desire to get into the IRBM program.

General PUTT. Right, sir.

Senator SYMINGTON. Along with the birth of that in a contract with Douglas, right?

General PUTT. Right, sir.

(The requested information has been supplied in classified form.)

Senator SYMINGTON. Tied in these requests is the idea of when there was some practical expression of the need for the weapon?

General PUTT. That is correct.

There was this factor that has a bearing on when we actually put dollars on to the program. It was our initial thought, on the basis of some preliminary studies that had been made, that we would be able to get an IRBM missile out of the ICBM program as a spinoff on some of the early year test vehicles, that we might be able to modify those and make them into intermediate ballistic missiles, and we spent some months studying that real hard.

Senator SYMINGTON. I am sorry. They are voting and we have to leave now.

(Whereupon, at 12:15 p. m., the committee was recessed, to reconvene at 2 p. m., of the same day.)

AFTERNOON SESSION

Present: Senators Symington (presiding) and Saltonstall.

Also present: Fowler Hamilton, general counsel; Ramsay D. Potts, Jr., associate general counsel; Fred B. Rhodes, legal consultant to Senator Saltonstall; Edward C. Welsh, assistant to Senator Symington; and Wallace L. Engle, staff member.

Brig. Gen. F. E. Rouse, United States Air Force; Maj. Gen. Samuel R. Brentnall, Assistant Chief of Staff for Guided Missiles; Brig. Gen. Charles M. McCorkle, Deputy Chief of Staff for Guided Missiles; Lt. Col. William F. LaHatte, Office, Chief of Research and Development; Mansfield T. Sprague, general counsel, Department of Defense; Capt. S. S. Searcy, Jr., United States Navy, Office of Chief of Naval Operations; Gen. Curtis E. LeMay, commander in chief, Strategic Air Command, and Jack L. Stempler, Assistant General Counsel, Department of Defense.

Senator SYMINGTON. We will call the meeting to order this afternoon.

Gentlemen, I am afraid it may be a little rough this afternoon because we are voting on the farm bill. We have already had two votes.

Mr. Counsel, you were asking questions of the witness.

Mr. HAMILTON. Yes, I was.

Senator SYMINGTON. Proceed, please.

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Mr. HAMILTON. General Putt, in your opinion would more money serve to expedite the ICBM program as it is now going forward?

**TESTIMONY OF LT. GEN. DONALD L. PUTT, DEPUTY CHIEF OF STAFF FOR DEVELOPMENT, HEADQUARTERS, USAF; ACCOMPANIED BY COL. ROBERT L. JOHNSTON, DEPUTY DIRECTOR, RESEARCH AND DEVELOPMENT, DCS/D, HEADQUARTERS, USAF; AND COL. CARL J. REBER, CHIEF, PROGRAM FUNDING DIVISION, ASSISTANT FOR DEVELOPMENT PROGRAMS, DCS/D, HEADQUARTERS, USAF—Resumed**

General PUTT. As the program is now going forward, I doubt whether additional dollars would expedite the availability date of the missile, the operational availability date.

MORE ICBM FUNDS NOT NEEDED NOW

It is possible that one might, by the application of more funds to duplicate approaches in the form of an insurance policy, be more certain as to being able to keep the schedule that is now laid down, but I do not believe that that would accelerate present operational availability data. (D)

Senator SYMINGTON. General, you have gone over the program, you know it pretty well.

Do you believe that that is going to be done?

General PUTT. I think it represents the best judgement that one can exercise in the light of the unknowns and the complexity of the development problems.

ICBM PROGRAM FIRM

I think it is a rather realistic schedule, and the fact that we have met the milestones in the program to date would indicate that at least the early planning had been quite realistic, and I have no reason to believe that, subject to the vicissitudes of not knowing exactly where we will wind up, that it is a real, firm program. (D)

Senator SYMINGTON. While we are on the subject there has been a statement that has always puzzled me a little by an official in the Department of Defense. He said that even if the Russians got the IRBM, it would not change the balance in Europe between the East and West.

SOVIET IRBM VS. BALANCE OF POWER

If that is true, why is it important for us to put so much effort on it?

First, in your opinion, is it true?

General PUTT. That the IRBM in the hands of the Russians would not change the balance of power?

Senator SYMINGTON. Between the East and the West.

General PUTT. In my judgement it would not materially change it.

Senator SYMINGTON. What do you mean by materially?

SOVIETS AIRCRAFT CAPABILITY

General PUTT. Well, for instance, if the Russians had no capability presently of reaching Western European targets that are occupied by our allies, and then suddenly had an IRBM, I certainly think there would be a significant change.

But they now have a capability to reach those targets.

Senator SYMINGTON. Well, they have no capability that would be equal to the capability they have had if they developed a good operational IRBM, have they?

General PUTT. Having an operational IRBM would add something to their capability.

Senator SYMINGTON. What you are really saying then, aren't you, is that inasmuch as they already have a knife that can do the job against Europe if they want to use it, it does not make any difference whether or not they get a modern automatic rifle. Is that correct, in effect?

General PUTT. That is correct.

Senator SYMINGTON. General Brentnall, would you agree with that analysis, or do you want to add anything to it?

General BRENTNALL. I agree in general.

I think the problem there, and this is personal opinion, is if the Russians have a capability of delivering their weapons with aircraft, having the IRBM on their side only shortens the time of delivery.

NATO NEED FOR GREATER DELIVERY CAPABILITY

Turning the problem around, if the NATO countries do not have the capability of delivery, they have to depend upon us, the furnishing to them of a capability would have a tremendous effect upon them.

Senator SYMINGTON. In other words, if we could give them the IRBM, it would be tremendously effective to them because, as you see it, the Russians already have the weapons with which to destroy Europe if they want to use it, even without the IRBM.

General BRENTNALL. Yes, sir.

NATO POWER INSUFFICIENT

Senator SYMINGTON. It is true, is it not, that our present European alliance has not the ability of destroying the Russians?

General BRENTNALL. Not to my knowledge; they do not have.

Senator SYMINGTON. Would you agree to that, General Putt?

General BRENTNALL. My answer was excluding the United States.

Senator SYMINGTON. Europe versus the Russians per se.

General BRETNALL. That is right.

Mr. HAMILTON. General Putt, may I just pursue that with a few questions?

NATO COUNTRIES LACK DEFENSE AGAINST IRBM

Do we now have in Western Europe, do the NATO countries have in Western Europe defenses against an IRBM attack that would be launched from Russia against that comparable to an airborne attack?

General PUTT. No; they do not.

Mr. HAMILTON. Does Western Europe have any significant defenses at the present time against an IRBM attack launched from Russian-controlled territory?

General PUTT. This is getting pretty far afield of my competence.

Mr. HAMILTON. You don't know whether they do or not?

General PUTT. That is right.

Mr. HAMILTON. Do you know, Colonel Johnston?

Colonel JOHNSTON. Not to my knowledge; no, sir.

Mr. HAMILTON. What do you mean, not to your knowledge?

Colonel JOHNSTON. If you are speaking now of a defensive system against this as compared to a counter——

Mr. HAMILTON. The question is this: Do the NATO countries have any significant defense at the present time against an IRBM attack launched from Russian-held territory?

Colonel JOHNSTON. I certainly have very little knowledge about the NATO structure.

Mr. HAMILTON. You don't know what their radar system is?

Colonel JOHNSTON. That was my question, whether you had reference to a defensive system per se or defense in the sense of a counter-offensive system.

Mr. HAMILTON. I meant just as a defense.

Colonel JOHNSTON. I know of no such system but that does not preclude them from being there.

Mr. HAMILTON. Do you have any knowledge on that point, sir?

General BRENTNALL. I have no knowledge on that point at all.

Mr. HAMILTON. If the NATO countries had no defense, no significant defense against an IRBM attack launched from Russian-held territory at the present time, assuming that, General Putt, would that change your view as to whether the balance between Europe and Western Europe Russian-held territory and Western Europe would be significantly affected if the Russians were able suddenly to put in operation a substantial number of IRBM's?

General PUTT. In my judgment I do not think that it would be significant.

Mr. HAMILTON. What would be your opinion as to our defenses in the NATO countries at the present time against an air attack from Russia?

General PUTT. I could only give a qualitative answer there, that certainly it must be greater than any defense they would have against an IRBM type of weapon.

Mr. HAMILTON. That is what I was getting at.

General PUTT. Yes; but I am not sufficiently familiar with the NATO forces to give any opinion as to how effective or ineffective those defenses might be.

### SOVIETS HAVE CAPABILITY TO ATTACK NATO SUCCESSFULLY

Mr. HAMILTON. Then that raises the question as to why you concluded that if the Russians had a substantial number of operational IRBM's, that would not increase their power vis-a-vis the defensive power of the NATO countries.

General PUTT. I said it would increase it, but I am not sure that the increase in the Russians capability of attacking Europe is significantly improved because they already have the capability of doing it.

Mr. HAMILTON. I am talking about attacking.

I suppose I could attack a platoon of troops, but the question is how successful the enterprise would be.

General PUTT. Yes.

Mr. HAMILTON. In other words, you think they could now sweep over Western Europe with their power?

General PUTT. I think they have the capability now to attack Western Europe.

Mr. HAMILTON. You said "attack." You mean attack successfully?

General PUTT. Attack successfully.

SIGNIFICANCE OF SOVIET IRBM'S

Mr. HAMILTON. Now then turning to one other branch of the question, if the Russians had in operation a substantial number of IRBM's, and if they were able to launch those IRBM's from submarines at the present time, would you think that that would significantly affect their power vis-a-vis ours?

General PUTT. You are not speaking of Western Europe now?

Mr. HAMILTON. No; I am speaking of the general situation worldwide.

General PUTT. The general situation.

Mr. HAMILTON. Let me put it to you perhaps in a melodarmatic way.

Suppose the Russians were able to convince the world tomorrow that they were able to successfully launch from submarines with a substantial degree of accuracy 600 IRBM's with thermonuclear warheads. Would you think that that would seriously change the present balance of military power between the Russians on the one hand and ourselves and our allies on the other, or significantly?

General PUTT. You are really getting out of the field of my competence, Mr. Counsel.

Mr. HAMILTON. I won't press for an answer on the question.

Turning now to research and development generally, and in particular to the procedure that you have described that you go through in getting funds to support a particular research and development program, and you have described the procedure that existed and that was applied not only to research and development funds generally but also to the IRBM and ICBM projects in particularly, and you have testified I believe, and correct me if I am wrong, that that procedure was changed in about November 1955 so far as ballistic missile projects are concerned?

General PUTT. Yes.

Mr. HAMILTON. Was any change made at that time with reference to the procedure to be followed in the case of other types of research and development projects?

General PUTT. No; no change.

RESEARCH AND DEVELOPMENT PROCEDURES TIME CONSUMING

Mr. HAMILTON. Now what in your opinion has been the effect of the procedure that applies to research and development projects in general with reference to whether or not that procedure in your opinion unduly delays those projects?

General PUTT. In my personal opinion and my judgment, I think that the procedures now are too time-consuming, unwieldy; there are too many reviews, too many committees to rapidly pursue the research and development programs.

This is not to say one should do away with all reviews. I think they have to be reviewed because programs have to be coordinated. I think the procedures now have got even too complicated and too time-consuming, there are too many places where one has to touch base.

Mr. HAMILTON. You are a member, are you not, of the Air Council?

General PUTT. Yes, sir.

AIR COUNCIL

Mr. HAMILTON. And am I right in the impression that I have that the Air Council is one way of describing the senior people on the Air Staff?

General PUTT. It is comprised of the Deputy Chiefs of Staff, the Inspector General and the Vice Chief of Staff of the Air Force.

Mr. HAMILTON. And does that staff consider not only research and development problems but problems in all of the other areas of the Air Force?

General PUTT. It considers all problems of the Air Force.

Mr. HAMILTON. Does it consider such things as requirements for SAC?

General PUTT. Yes; indeed.

Mr. HAMILTON. Requirements for ADC?

General PUTT. Correct.

Mr. HAMILTON. For TAC?

General PUTT. Correct.

Mr. HAMILTON. For the training command?

General PUTT. Correct.

Mr. HAMILTON. Does it consider personnel problems?

General PUTT. Yes, sir.

Mr. HAMILTON. Base problems?

General PUTT. Right.

Mr. HAMILTON. Equipment problems?

General PUTT. Absolutely.

Mr. HAMILTON. As well as research and development problems.

General PUTT. As well as research and development problems.

Mr. HAMILTON. So that the testimony you have given with reference to research and development has been testimony you have given in light of your experience as a member of the Air Council considering all of these other problems as well?

General PUTT. That is correct.

Mr. HAMILTON. During what periods of time have you sat on the Air Council?

General PUTT. On a prior assignment to Washington in 1952, the last 6 months I was here I was acting Deputy Chief of Staff, Development. I sat on the Council at that time.

Mr. HAMILTON. For about how long?

General PUTT. This would have been from June to January, 6 to 7 months, and then since my return to Washington in April 1954 in my present position I have been a continuous member on the Air Council.

GUIDELINES ESTABLISHED PRIOR TO EVALUATION OF NEEDS

Mr. HAMILTON. Now can you tell us, with reference to the guidelines, what examination if any is made by the Office of the Secretary of Defense of the research and development requirements of your department prior to the time that a guideline is issued for the fiscal year to which the guideline in question relates?

General PUTT. At least during the years that I have been intimately associated with the procedure—involved in the procedure and a member of the OSD Research and Development Policy Council, there has not been an examination of the technical program requirements prior to the establishment of the guidelines.

Mr. HAMILTON. Pardon me; are you finished?

General PUTT. I believe so.

Mr. HAMILTON. What is the Research and Development Policy Council?

RESEARCH AND DEVELOPMENT POLICY COUNCIL

General PUTT. The Research and Development Policy Council is an instrument of the Office of the Assistant Secretary of Defense for Research and Development.

This is Dr. Furnas.

Mr. HAMILTON. At the present time?

General PUTT. At the present time. Also due to an organizational change since the office was organized—I believe this was the result of one of the Hoover Commission reports—the Research and Development Policy Council also has members or can be said to be also an instrument of the Office of the Assistant Secretary of Defense, Applications Engineering, so that on it now sit Dr. Furnas and Mr. Newberry, Assistant Secretary of Defense, Research and Development, and Assistant Secretary of Defense, Applications Engineering, respectively.

Mr. HAMILTON. How is that Council constituted in terms of the people that are on it and the numbers of each?

General PUTT. Well, in addition to those two which I have just named, there will then be the 3 military members from the 3 departments, Army, Navy, and Air Force, these military members being my opposites in the Army and the Navy, the military men responsible for the development in each of their respective services.

Mr. HAMILTON. Who is that in the Army now, Lieutenant General Gavin?

General PUTT. That is correct.

Mr. HAMILTON. Who is it in the Navy?

General PUTT. This is Admiral—they have had a recent change.

Mr. HAMILTON. You can supply it to the subcommittee.

General PUTT. Yes, sir.

I know that Admiral Bennett sits on it. I am not sure he is the original member.

Admiral Bennett is the Chief of the Office of Naval Research.

Mr. HAMILTON. In addition to the three military gentlemen who sit on it?

General PUTT. In addition to the three military members is the Assistant Secretary of Air for Research and Development and the corresponding civilian Assistant Secretaries from the Army and the Navy.

Mr. HAMILTON. That gives us six members?

General PUTT. That is six members.

Now that is the research and development side of the 3 services, but since this is a combined research and development and applications engineering organization, also sitting on the Council now will be the 3 Assistant Secretaries from the 3 services whose responsibility is procurement and production.

Mr. HAMILTON. And who is that in the case of the Air Force?

General PUTT. This is Mr. Sharp, and in addition there would be the 3 military members from the 3 services who are responsible for production procurement.

In the case of the Air Force, this is General Irvine.

Mr. HAMILTON. So you have the 12 you mentioned?

General PUTT. Twelve, plus the two from the office of Secretary of Defense.

Mr. HAMILTON. And the gentlemen from the Office of the Secretary of Defense are whom?

General PUTT. That is Dr. Furnas and Mr. Newberry.

Mr. HAMILTON. That is the Assistant Secretaries of the Department of Defense who are concerned respectively with research and development on the one hand, and what is it on the other?

General PUTT. Applications engineering.

Mr. HAMILTON. Does that Council have any concern with the guidelines that are issued to the services of research and development.

SOURCE OF RESEARCH AND DEVELOPMENT GUIDELINES

General PUTT. Yes, it does. The guidelines are drafted in the Office of the Assistant Secretary of Defense for research and development.

Mr. HAMILTON. Yes, I see, research and development.

General PUTT. These then are discussed at a meeting of the Research and Development Policy Council.

Mr. HAMILTON. Was that procedure followed in the case of the guidelines that were issued for research and development with respect to fiscal year 1955?

General PUTT. They were.

Mr. HAMILTON. And with respect to the fiscal year of 1957?

General PUTT. They were.

Mr. HAMILTON. And with respect to the fiscal year 1958?

General PUTT. Yes, they were discussed.

Senator SYMINGTON. Have you gone into the 1956 budget at this point?

General PUTT. The guidelines for 1956 have been issued, and we are just now going into the formulation of our 1958 research and development program.

Senator SYMINGTON. Could you give us a definition, as short as you can, carrying the thought of guidelines.

CEILING ON DOLLARS

General PUTT. First the guidelines would contain the ceiling figure on funds for which the Departments were to submit a program.

Senator SYMINGTON. Let's talk about them one by one.

Is that the end of that first?

General PUTT. So far as dollars are concerned that is the end of that.

Senator SYMINGTON. Now that means that you are told that no matter what your problem is, you are to ask for a program based on only so much money.

Is that a fair statement?

General PUTT. It is a fair statement but not quite complete.

Mr. HAMILTON. Will you complete it?

General PUTT. I will complete it.

Using as an example the 58 guidelines, in addition to a dollar ceiling for which a program is to be presented, there then is required an additional list of projects which the 3 departments would like to pursue to a dollar value of 15 percent more than the ceiling that has been given by a definite figure, a definite amount of dollars.

Mr. HAMILTON. In other words, you are told as the head of research and development, the Air Force is told and you are told at a point in the discussion that you are to have, we will say, a million dollars for research and development, and the Army is to have a million dollars and the Navy is to have a million.

That is $3 million. And you are allowed to increase that by $450,000 as a combined pool based on what you present you need in addition to the million dollars, but it cannot be over 15 percent, and it is handled as a 15-percent pool of all 3 services or individually.

PERCENT OF FLEXIBILITY

General PUTT. No; as individuals, and I want to make a correction, it was 10 percent instead of 15 percent.

Senator SYMINGTON. So if you are allowed a million dollars in the Air Force, $1 million.

General PUTT. I could submit $100,000 worth of projects. And then again going back to the 1958 guidelines as an example, I can then submit an additional list of another 15 percent, so this is really a ceiling plus a total of 25 percent over and above the ceiling figure.

Senator SYMINGTON. You can submit 10 percent more and then what is that 15?

General PUTT. That is just another additional list of 15 percent more.

Senator SYMINGTON. When did that come into effect?

General PUTT. This specific procedure——

Senator SYMINGTON. In other words, why wasn't it 25, or if it was first 10 and then 15, what were the dates of the 10 and the 15?

General PUTT. The 10 and the 15 both came out at the same time.

Senator SYMINGTON. What is the difference between them?

General PUTT. I think I could clear this up easiest by just quoting:

**The initial budget estimates for the research and development appropriations of the departments and joint agencies should be consistent with the planning figures given above. In addition, however, each department and joint agency may submit two supplemental lists of projects of lower priority to cover important items which cannot be funded adequately under the planning figures.**

**The first supplemental list will total 10 percent of the planning figures and will consist of projects whose priority does not warrant inclusion under the planning figures.**

**The second supplemental list will total 15 percent of the planning figures and will include projects of lower priority than those included on either the planning figure list or the first supplemental list.**

Either or both of these lists may include additional items that do not appear in the basic planning level budget as well as supplements to items that are included but for which proposed funding is considered inadequate.

### POSSIBLE CONFLICT BETWEEN CEILINGS, PRIORITIES, AND NATIONAL SECURITY

Senator SYMINGTON. Now let me ask a question there.

You are working for security. Some of us used to work for profit. Engineering planners decided we needed a 4-tube, 6-tube, 8-tube, 10-tube, and 16-tube, radio set.

With the exception of one of those, the price model, there was no way you could say at the start there was any priority between the others.

If you tried to set a priority and you missed the best selling model, you would lose your dealers. If you missed on any security type priority, as I see it, you might lose your country.

If you decide on the first necessity, the price model, which in this case would be the ICBM, and then you say all the others are the same in priority, the IRBM, the atom plane, whatever is the successor to the B–52, how can you establish priority on those? But this plan says, in effect, you either establish priority or you do not get the money. Is that right, as you see it?

General PUTT. In practice we have to list these things as best we can in an order of priority and put the dollar sign out here at the right-hand column, and when the total gets down to equal the planned ceiling, you draw a line and everything below the line drops out.

Senator SYMINGTON. In other words, you have to guess, even when you know your guess may be wrong.

General PUTT. We have to exercise our best judgment.

Senator SYMINGTON. At the same time, your overall judgment is that there should be no priority on an item arbitrarily forced into a lower priority position because of a decision about money. Is that correct?

General PUTT. Yes, depending upon where the ceiling is put, some things that you might think are very high priority can fall out of the program.

Senator SYMINGTON. Let me be sure I understand.

For 5 years I defended a military budget. I think I understand what we are talking about.

They say, you can spend $1 million; but if you are going to spend any more, it has to be on something which you think is of a lower priority; and if you are going to spend any more than 10 percent of that more, you have to spend the latter on something with a still lower priority.

And if you say, "But I cannot possibly gage after the No. 1 priority," by the rules you still have to guess no matter if you think your guess may well be wrong.

General PUTT. You have to make a guess as to where to put your money.

Senator SYMINGTON. What were the guideline figures for 1955 for the Air Force?

General PUTT. The copies that we have we have furnished to the committee. Mr. Chairman, yesterday we ran into difficulties in trying to reconcile some of the figures.

I would much prefer to submit these for the records.

Senator SYMINGTON. Haven't you the figures on the guidelines first given to the Air Force in 1955?

If you have not, have you them for 1956?

Have you them for 1957?

General ROUSE. Sir, these have all been transmitted to the committee.

Senator SYMINGTON. If they have, you did not give us your last copy.

General ROUSE. Yes, sir; General Putt's copies.

DEPARTMENT OF DEFENSE ESTABLISHES GUIDELINES

Mr. HAMILTON. These are not Air Force guideline figures that you gave us. They are Defense Department's.

General PUTT. Yes, they stated what ceiling we had. For 1955 it was 431 million.

Senator SYMINGTON. That is what was given you for 1955 as a guideline.

For 1956 what was it?

General PUTT. 431.

GUIDELINES ESSENTIALLY SAME FOR 3 YEARS

Senator SYMINGTON. In other words, for 3 years there is no change of any kind in the amount of money given as your guideline, regardless of (1) a lowering in the value of the dollar, (2) an increase in the development of your research programs, and (3) any increase in the military airpower of the possible enemy. Despite these three factors, you were still given the same guidelines for 3 consecutive years.

General PUTT. Essentially the same guidelines.

Senator SYMINGTON. What is the figure for 1958?

Mr. SPRAGUE. May I object to this?

Senator SYMINGTON. I looked at you because I heard you wanted to. Please state your position for the record.

General PUTT. I have to qualify it because there are some accounting changes in there.

OBJECTION TO FURNISHING COMMITTEE 1958 GUIDELINES

Mr. SPRAGUE. I would like to state an overall objection for the record to the submission of the guidelines for fiscal 1958.

Senator SYMINGTON. Would you state your position?

Mr. SPRAGUE. The request was made to me by the staff for fiscal years 1955 through 1958.

We have submittted the guidelines for fiscal 1955 through 1957.

The guidelines for fiscal 1958 have been issued in the last 2 or 3 days.

However, the objection to the introduction of those guidelines to the record is based on the fact that, No. 1, these deal with prospective budget figures which have not been prepared.

Senator SYMINGTON. Excuse me, Mr. Sprague.

You have been sworn, haven't you, sir, before?

Mr. SPRAGUE. No, sir: I have not.

Senator SYMINGTON. Well, you are testifying now.

Would you mind standing and raising your right hand. Do you swear that before this Senate Subcommittee on the Air Force of the Senate Armed Services Committee you will give the truth, the whole truth, and nothing but the truth?

Mr. SPRAGUE. I do.

Senator SYMINGTON. Thank you.

Mr. SPRAGUE. Secondly, it relates to a budget which will be submitted to a different Congress than this one, and third, I think in the overall interest of fairness, that it would only be confusing because the figures in themselves as stated in the guidelines are purely tentative with reference to the fiscal year 1958 budget?

Senator SALTONSTALL. Mr. Chairman, may I make a remark?

Senator SYMINGTON. Yes.

Senator SALTONSTALL. I have just come in, but these figures that General Putt has given are the same figures you gave yesterday; are they not?

General PUTT. No.

Senator SALTONSTALL. From memory, listening, I thought those were the same figures that you had used when you ran those figures down, from 1946 down.

Am I not correct in that?

General PUTT. Well, to the extent that the dollars stated in the guidelines corresponded to the subsequent appropriations——

Senator SALTONSTALL. That is what I meant.

General PUTT. They are recognizable as the same figures.

Senator SYMINGTON. The three figures he has given us, Senator, are the same for those 3 years.

It is my recollection that there were no figures exactly the same as what he gave us yesterday.

Senator SALTONSTALL. The reason I brought that up, I am very frank to say, it is not clear to me and has never been clear to me as to what those figures are that you say that you get for your department as opposed to the figures that are submitted as appropriations for those same items.

Senator SYMINGTON. If the good Senator will read the record, we have been over that in considerable detail just before he came in. I was not clear on it either. That is why I asked about it.

Fred, would you agree it has been pretty well set down in the record?

Mr. RHODES. We have been over it. I hope it is clear.

Senator SYMINGTON. Let me comment here, if I may, on what Mr. Sprague said.

The Chair does not agree with him.

The Chair appreciates his courtesy and cooperation during all these proceedings and will take his position under advisement with the committee and the committee counsel; also with the chairman of the full committee. The Chair will then state the position of the committee with respect to this refusal of information.

Mr. HAMILTON. Did your objection, Mr. Sprague, go to the point of a request that the witness not be asked to testify about it, or were you simply making the objection for the record?

Mr. SPRAGUE. I have to make it in both respects.

Mr. HAMILTON. You request that he be directed not to answer the question.

Mr. SPRAGUE. Yes.

Senator SYMINGTON. I am sorry this had to come up; but that is that.

Mr. HAMILTON. I have some more questions.

Turning to the guideline for 1955 which you have testified, General, was considered by the Research and Development Policy Council, and directing your attention to that part of the guideline that established a ceiling for funds for research and development, did the council agree with the height of the ceiling for funds that was established in that guideline?

General PUTT. I cannot be positive of the year 1955 and I would have to look at the minutes of the meetings.

Mr. HAMILTON. Would you supply that, please, for the record?

General PUTT. I will.

I do know that last year the guidelines——

Mr. HAMILTON. What year?

General PUTT. For 1956, that all members, all of the service members of the Council protested the ceiling.

The requested information is as follows:

Available records do not indicate what position the service representatives took on the fiscal year 1955 research and development guidelines or whether there was any Policy Council discussion of the matter.

PROTEST AGAINST CEILINGS

Mr. HAMILTON. Was there any change in the ceiling after that protest was made?

General PUTT. There was no change in the ceiling.

Mr. HAMILTON. What was the situation in that regard with respect to the guidelines for 1957?

General PUTT. For 1957 the situation was about the same.

Mr. HAMILTON. And by the same what do you mean, sir?

General PUTT. The service members protested the ceiling.

Mr. HAMILTON. And now was there any change made in the ceiling after that protest was made?

General PUTT. There was no change, to my knowledge.

Mr. HAMILTON. Now, with respect to the formulation of the guideline for 1958, did the Council review that guideline?

General PUTT. The guidelines were reviewed in their draft.

Mr. HAMILTON. Pardon me; before I pursue that, do you want to object, Mr. Sprague, to this line of questioning?

Mr. SPRAGUE. I am sorry; I did not hear the question.

Mr. HAMILTON. I have been questioning General Putt as to whether these guidelines for the fiscal year 1955, 1956, and 1957 were reviewed by the Research and Development Policy Council, and his testimony was that they were and the service members as to the guidelines for 1956 and 1957 protested the ceiling but that after the protest the ceiling was not raised.

He is going to supply for the record the situation with respect to the review by the Council of the guidelines for fiscal 1955, and I was just beginning to ask him what the situation in that regard was with respect to the guideline that had been submitted to the Council for fiscal year 1958, but I wanted to ask whether or not your organization went to his testimony on that point, as to whether you would

object to his testifying as to the action of the Council with respect to the proposed guidelines for 1958.

EXPLANATION OF DEPARTMENT OF DEFENSE OBJECTION TO GUIDELINE SUBMISSION

Mr. SPRAGUE. My objection basically goes to the dollar amounts, which I do not think in the record are by any means final.

I do not object to any other questions on the point, and no objection with respect to questions on 1955, 1956, and 1957.

Mr. HAMILTON. My question is going to be whether the Council approved the amount of dollar ceilings that was established in 1958.

Mr. SPRAGUE. No objection.

General PUTT. The service Council members did not approve of the ceiling figure.

Mr. HAMILTON. For the guideline for 1958?

General PUTT. That is right.

Mr. HAMILTON. So far has there been any change in the ceiling for the guideline for 1958?

General PUTT. The addition of the 10 and the 15 percent lists are a change over the initial draft guidelines that were considered by the policy council?

Mr. HAMILTON. With respect to guideline for 1958?

General PUTT. 1958.

Mr. HAMILTON. Is there any other change in that respect, with respect to the ceiling?

Senator SYMINGTON. I am sorry, we will have to suspend.

(Short recess.)

MINUTES OF COUNCIL MEETINGS

Mr. HAMILTON. General, could you supply for the record—perhaps I should address this question to someone else—the minutes of the meeting of the Council for the sessions at which the guidelines for the fiscal years in question, 1955, 1956, 1957, and I will request 1958—I understand it won't be supplied—or should that go to the Department of Defense?

General PUTT. That should go to the Department of Defense.

Senator SYMINGTON. Senator Saltonstall, you remember General LeMay.

The committee will come to order, please.

Mr. Counsel, will you tell us what you want to do?

PROCEDURE RE GENERAL L'MAY TESTIMONY

Mr. HAMILTON. The matter that we are now considering of the procedure, suggested form of procedure to be followed in an endeavor to produce the record of Gen. Curtis LeMay's testimony that will be of such a character that while preserving the substance of General LeMay's testimony, will meet security requirements to the point where it can be released generally to the public.

Senator SALTONSTALL. You mean the testimony that he rendered in executive session?

Mr. HAMILTON. That is right, sir.

Senator SALTONSTALL. Because the other has already been given out.

Mr. HAMILTON. Yes, sir.

Senator SYMINGTON. It is a little more than that if I may say so, Mr. Counsel. The testimony has been examined by Admiral Davis, in my opinion in very able and fair fashion. Some of it he has deleted. Some of it, after protest, he agreed not to delete. Some of it he deleted despite protest.

Sometimes, where the thought could be given without figures, suggested language was accepted or countersuggestions came from him to maintain the thought and at the same time not giving what Admiral Davis thought was classified information.

As a result, the Chair and the Counsel feel that the committee would be glad to acquiesce in the recommendations made by Admiral Davis.

Inasmuch as this testimony changes the phraseology of General LeMay, the latter stated that he would like to examine the changes, the degree of changes, in substitute language.

Then, as I understand it, he would like to testify on those points again for the record. Is that correct?

Mr. HAMILTON. There are 1 or 2 points I think I should amplify for Senator Saltonstall.

It is my understanding that General LeMay, who has not seen any of the proposed changes in language, Senator, of course stands by the testimony that he gave.

As the chairman said, and as I think I mentioned to Mr. Rhodes, we sat down with Admiral Davis to see if we could work out, with appropriate safeguard to the security of the country, changes in phraseology without changing the substance of certain of General LeMay's testimony.

General LeMay has not seen those changes. I think the question before the committee at this time is this: Would the committee like to request General LeMay to review those parts of his testimony as to which Admiral Davis and the others of us who have been concerned with it have suggested rephrasing, so that General LeMay can determine what, if any, changes he is willing to make that will in his view preserve the substance of his testimony and still meet the security requirements of Admiral Davis?

Senator SALTONSTALL. As one person on this side of the aisle I have no objection to that, with this proviso: That I would like to have it understood that Mr. Sprague, who is representing the Department of Defense, has an opportunity to see that revamped testimony, and if there are any changes in substance that he thinks are changes in substance, then I think before it is published, that the committee should have a chance to discuss it and possibly ask General LeMay to come before it.

I see no reason for General LeMay, unless the chairman wants or the majority wants, to come before the commitee again if there are no substantive changes in his testimony.

Senator SYMINGTON. Could the chairman ask whom he would want as censor?

Senator SALTONSTALL. The Department of Defense.

Senator SYMINGTON. Who in the Department of Defense?

Senator SALTONSTALL. I don't know.

Mr. SPRAGUE. Mr. Wilson?

Senator SALTONSTALL. Mr. Wilson.

Senator SYMINGTON. Doesn't Admiral Davis have authority to do the job he was appointed for?

Senator SALTONSTALL. Certainly, but he has not personally heard General LeMay testify.

I am speaking for myself now.

Mr. HAMILTON. I think Senator Saltonstall's point as I understand it, and it seems to me to be a perfectly sound point, is that he wants to be sure that no change in the substance of the testimony is made.

Senator SALTONSTALL. That is correct.

Mr. HAMILTON. And the testimony released until he and Senator Duff have had the opportunity or anyone else concerned with the testimony to review it to see if they would like to get additional or supplemental testimony.

Senator SALTONSTALL. I would say as far as I am concerned, and I think Senator Duff would agree, that Mr. Sprague could speak for us, and if he approves there has been no change in substance, that would be satisfactory to me.

Senator SYMINGTON. What do we mean by substance?

If General LeMay is satisfied with the Department of Defense censorship of the testimony, why isn't that all right?

Senator SALTONSTALL. He has been over it; I have not been over it. The only alternative would be to have General LeMay come and read the whole thing out again.

Mr. HAMILTON. Would this meet the point, Senator?

It seems to me, as I said, I see your point, and you want to be sure as far as you and Senator Duff are concerned, that there is no change in the substance of the testimony before it is released without your having an opportunity to interrogate General LeMay.

Senator SALTONSTALL. That is absolutely correct.

Mr. HAMILTON. That certainly seems to be sound, and I am sure General LeMay has no intention of changing the substance of his testimony but out of an abundance of caution you naturally would want to have a look at it.

Senator SALTONSTALL. I would say for that purpose I would be satisfied with Mr. Sprague.

Senator SYMINGTON. I want to bend over backward but Senator Duff is not here and we delay and delay in getting this testimony out.

Senator SALTONSTALL. This won't delay it 5 minutes.

Senator SYMINGTON. I think Senator Duff went back to Philadelphia, didn't he?

Senator SALTONSTALL. I know. I say most respectfully—perhaps I don't make myself clear—I think Mr. Hamilton has got my point.

Senator SYMINGTON. Two much more able men than I.

Senator SALTONSTALL. You know and I know if you and I sit down and work something out, it may have a different meaning to us than it does to a third person who looks at it clean, and all I want to know is that after General LeMay and Admiral Davis have worked out the general's testimony, which I do not believe for one moment will be changed in meaning, that Mr. Sprague, who has heard all this business himself, has a chance to look it over.

The only alternative would be to have me do it myself.

Mr. HAMILTON. Senator Saltonstall, suppose we just sit down, those of us concerned with it, right now, and work it out.

Senator SYMINGTON. Could you think of something we could do this afternoon?

Senator SALTONSTALL. Is it going to be done this afternoon?

Mr. HAMILTON. That is what we all had in mind, is going into another room here and going into it right now.

Senator SALTONSTALL. Why don't you two gentlemen go in and do it now?

Mr. HAMILTON. Is that agreeable?

Senator SYMINGTON. Perhaps General LeMay—and I have not discussed this with him or anybody else—would like to restate his position before the committee, so that it is a matter of committee record.

Mr. HAMILTON. The first thing in fairness to General LeMay, the matter before the committee, does the committee want at this time to ask General LeMay to do this?

Senator SYMINGTON. The Chair would urge that whatever General LeMay would like in that regard be acceded to.

Mr. HAMILTON. Is this course satisfactory, Senator Saltonstall, to you, to ask General LeMay if he will see whether or not by changing some of the language as to which security questions have been raised he can preserve the substance and produce a record?

Senator SALTONSTALL. I have no objection to that at all. The only point that I make, and I reiterate because it seems perfectly clear to me and I am sorry I don't make myself clear, is that I simply want to see, as an outsider who has not drafted the language, that the meaning has not been changed.

And for that purpose I am willing to have stand as my proxy Mr. Sprague.

That is all.

Mr. HAMILTON. That would be handled satisfactorily after we have heard from General LeMay if we sit down and work it out.

Senator SALTONSTALL. If General LeMay wants to say something, I will be happy to listen to him.

Senator SYMINGTON. General LeMay, will you please consider yourself sworn and say whatever you think appropriate at this time?

General LEMAY. Yes, sir.

Mr. Chairman, it is my understanding that the committee desires to release as part of the public record as much as my testimony as possible.

Senator SYMINGTON. That is correct.

General LEMAY. When it was presented to the Department of Defense, certain portions of the record for security reasons were deleted. As the result thereof the continuity of the testimony is not such that it will carry a continuous story to the public.

Therefore, you would like to have me rephrase some of my answers in language that will clear censorship and not destroy the continuity of the story, and still not divulge classified information.

Senator SYMINGTON. That is right.

General LEMAY. Now I understand that the counsel has presented to Admiral Davis, the censor, some suggested changes.

I have not looked at those suggested changes nor do I intend to look at them. I am sure that I am perfectly capable of carrying out your desires without doing that and using language of my own.

Senator SYMINGTON. Then that means you would like to testify against those questions yourself?

General LEMAY. Yes, sir.

Senator SYMINGTON. Is that correct?

General LEMAY. Yes, sir.

Mr. HAMILTON. But as I understand it, Mr. Chairman, that General LeMay would propose to do that by writing into the transcript the changes that he has in mind or do you want to come back again before the committee?

General LEMAY. I would prefer to have the transcript in closed session remain as it is, and add to that another answer to that same question phrased differently so as to not violate security.

Senator SYMINGTON. Very well.

You can get started with Admiral Davis and a secretary. You could study the question, add the rephrasing. When you are ready, you can retestify, or state that is the way you would have it. How is that?

General LEMAY. Either way that the committee wants.

Senator SYMINGTON. Whatever suits your convenience.

General LEMAY. I can go to work on it right now.

Admiral Davis is here from the security standpoint, and I think we could carry out your desires this afternoon on the few points in question.

Mr. HAMILTON. In view of that, to take account of Senator Saltonstall's point, he would want Mr. Sprague to sit in on this.

Senator SALTONSTALL. That is right; and with the further proviso that if Mr. Sprague and General LeMay and Admiral Davis differ, then the question will come up.

Mr. HAMILTON. I suppose if there is any difference it will come before the committee.

Senator SYMINGTON. But there has to be a difference in substance and not a difference in censorship.

Senator SALTONSTALL. A difference in substance. I don't know just what you mean by censorship.

Senator SYMINGTON. Either Admiral Davis is the censor for the Department of Defense, or he is not. If he is, then he is the final authority, not Mr. Sprague, on what is to be censored. Mr. Sprague, as I understand it, is the final authority on whether or not something is in now that was not in before, or that will look different, even though we did not mean to make it look so.

Senator SALTONSTALL. That is right.

Senator SYMINGTON. Now we understand. Where is Admiral Davis?

Mr. HAMILTON. He is out in the ante room.

Mr. SPRAGUE. May I state something for the record, Senator?

Senator SYMINGTON. Yes.

Mr. SPRAGUE. Admiral Davis is not concerned with the substance of the testimony at all and will not be.

Senator SYMINGTON. That is what I have been trying to say.

General LEMAY. I don't intend to change the substance of my testimony at all. I have not changed my mind on any of it at all, but

I am perfectly willing to rephrase it so that we can give some continuity to the public record.

Senator SYMINGTON. That is what we want, General.

Senator SALTONSTALL. Mr. Chairman, while we are all being interrupted, I just respectfully say that on the basis of the testimony this morning, Mr. Rhodes has two questions that I would like to have him ask when counsel gets through.

Senator SYMINGTON. He can ask them right now.

Mr. RHODES. I did not want to interrupt your line of questioning.

Senator SYMINGTON. Go right ahead.

Mr. RHODES. The thing that interested me, and I believe this morning you mentioned this informally, the problem of funds and the problem of centralizing the effort in this ICBM and IRBM work. I believe this afternoon you testified as to the fund part in response to Mr. Hamilton's direct question on the point.

The other one that you raised and which is intriguing is this matter of the formation of a Manhattan-project approach to the missile program.

### MANHATTAN PROJECT APPROACH TO LONG-RANGE MISSILES

Is it your opinion that such an approach would materially advance the ultimate date of achievement?

General PUTT. To answer that I first have to define or get your definition of what the adjective "Manhattan" means to you, or I will have to state what it means to me.

Mr. RHODES. I took it to mean a tri-service approach to the problem of getting ultimately a weapons system.

General PUTT. Let me think about that for a moment because I don't think in terms or don't use the term "Manhattan type of approach" in terms of three services.

Mr. RHODES. I mean you can apply it to one service if you want.

General PUTT. I will then define what Manhattan means to me and then attempt to answer your question.

A Manhattan-type project can mean two things to me: One, it describes the largeness, the bigness of the effort and nothing more. In other words, it is very important.

You have to put a lot of effort on it, and so what we are saying is that it is a big and great, important project.

Another way it can be defined is that the use of the word "Manhattan" describes quite specifically an organization which was the Manhattan project for the development of the atomic weapon.

Now let me answer the first definition.

I would say that if you have an important project to get done, and get it done as soon as possible, there should be a lot of effort on it, it should be a big project to get it done, and I would then say that this is exactly what is taking place right now.

Mr. RHODES. The Western Development Division, right?

You have that in the Western Development Division?

General PUTT. That is right, Western Development Division. Now as regards the use of Manhattan to describe a specific type of organization to handle a big project, then I would say that the type of organization that we now have to handle the ICBM under today's con-

ditions are immeasurably better than the Manhattan type of organization that was used to develop the atomic bomb.

Senator SYMINGTON. Would you yield there a minute, Mr. Rhodes? Are you through with the questioning on the Manhattan project?

Mr. RHODES. I was going to refine it a little bit but you go ahead.

Senator SYMINGTON. I will wait for your question.

Mr. RHODES. I take it then that you feel that the command structure as such with the Western Development Division is for this particular purpose better and that you are giving General Schriever all of the authority that he needs to get the job done?

General PUTT. I think this is right.

Mr. RHODES. He is getting people, things and all that he needs to get on with the job?

General PUTT. That is right.

MANHATTAN PROJECT APPROACH NOT NECESSARY

Mr. RHODES. So that, as many people have said, you could not improve the situation by resorting to an all-stops-pulled Manhattan project approach.

You would not advance your ultimate date?

General PUTT. I don't think we would.

If it is of interest I can explain why. If not——

Mr. RHODES. No; I think you have answered very frankly, sir.

Senator SYMINGTON. My question is: the Manhattan project was conceived and carried on to develop a completely new weapon; is that right?

General PUTT. Right, sir.

Senator SYMINGTON. And this ICBM or an IRBM is not completely new and is more than a weapon.

It is a weapons system; isn't that correct?

General PUTT. That is right.

Senator SYMINGTON. So the two are not analogous as far as what you are doing is concerned; is that correct?

General PUTT. I would say that they are not exactly comparable.

Senator SYMINGTON. And just giving something a name like "Manhattan" isn't the answer. You might call a boxer Young Dempsey, but that does not mean he is another Jack Dempsey; does it?

General PUTT. No.

Senator SYMINGTON. Just because you gave a special name.

General PUTT. That is correct.

Senator SYMINGTON. You don't have to get out of the Pentagon to clean this situation up, do you?

I will rephrase the question.

COMPLICATION COULD BE CLEARED UP IN PENTAGON

If you reorganized this incredibly complicated organizational structure, you could do it inside the Pentagon, without taking it outside the military services; couldn't you?

General PUTT. I think it can be done without taking it outside of the military services, and within the Air Force I would leave the organization exactly the way it is.

Senator SYMINGTON. Do you have a second question?

Mr. RHODES. The other question was on the matter of guidelines.

Could you not use the 1955–1956–1957 guidelines to illustrate the points which you have been making in answer to Mr. Hamilton's questions?

Do not the principles remain the same?

General PUTT. They do.

Mr. RHODES. So that you could for illustrative purposes use those just as well as turning to the 1958?

General PUTT. I could.

QUESTION OF EMBARRASSMENT

Mr. RHODES. I am thinking now of the embarrassment which you may meet in coming before the Appropriations Committee having had at some point along the line to either expand or contract in a given area which would be maybe adversely reflected by testimony which you might give here today.

Senator SYMINGTON. The Chair cannot follow Mr. Rhodes' line of reasoning if the guideline has been presented promptly. Nor do I think, General, that you will be embarrassed by anything you say here with respect to your analysis of the guideline, and your telling us of the guideline concept, what the facts are with respect to that concept.

I would say that the only embarrassment may well come when these facts are placed before the Appropriations Committee.

As to what is done this year with respect to the money, I am not particularly interested. We are not after more money in these hearings. We are after getting the truth out to the American people.

In my opinion the only embarrassment which may come will not be to you, but possibly to the Department of Defense, if the latter maintains for the fourth straight year the same fiscal guideline on research and development, despite the incredible increase in the air strength of the possible enemy, the normal increase in the cost of all the research projects and the lightening of the purchasing power of the dollar.

Senator SALTONSTALL. Mr. Chairman, can we just wait until we hear all the witnesses before we reach those conclusions, at least before I reach them.

Senator SYMINGTON. I would have been glad to wait, but your counsel was not; and I didn't want the witness to feel any testimony he gave today might embarrass him later.

Mr. RHODES. May I just say a word as to what stimulated me to ask the question?

Senator SYMINGTON. Please say all you want.

Mr. RHODES. It occurs to me the Department of Defense is in the process now of what is a housekeeping matter and I asked him if he could not use for illustrative purposes 1955, 1956, and 1957.

Senator SYMINGTON. He gave those, and we thought he might also use, for illustrative purposes, 1958, inasmuch as he has the figure but we have not.

But possibly for reasons which might be embarrassing to the Department of Defense, certainly not to the witness, under oath to tell the truth, which he would do anyway; and certainly not to our counsel and the committee who asked for them, they do not want to give the figure. We have acquiesced in that.

Mr. HAMILTON. Has the committee acquiesced in not giving the figure for 1958?

Senator SYMINGTON. I think we said we were going to take it under advisement, did we not?

Have you any more questions?

Will you proceed, Mr. Counsel?

Mr. HAMILTON. General Putt, is there anything you would like to add?

EFFORTS TO RECONCILE BUDGET FIGURES

General PUTT. Yes. I feel compelled to make some comments here by reason of the line of questioning, and also because of the difficulties that we ran into yesterday and seem to be running into today in reconciling some of the budget figures that have been given.

It certainly is not my desire nor my intent to give any figures lower than what the true facts are.

First off in my office, the Deputy Chief of Staff, Development, we maintain some general records as to the dollars that we have available.

However, the responsibility for the most accurate figures possible is that of our budget officer in the Office of the Deputy Chief of Staff, Comptroller.

In all the years I have been in this business, I have found that figures are most difficult to latch on to, and we yesterday did and today are running into difficulty of terminology and bookkeeping changes that it is almost impossible at least for me to keep up with.

We took the figures that Senator Saltonstall read yesterday as laid beside the ones that I had given, and while we have not been able to research those completely, I think that we will be able to reconcile all of the figures that I gave with those that have been quoted.

Now part of the difficulty here is that in many cases there are adjustments during the year where there are reimbursements from one service to another.

These may not ever go through my office.

It is a bookkeeping transaction that takes place in the Office of the Comptroller or the Budget Office, so that in general if I am required to give more figures, I must qualify those by saying that they are roughly orders of magnitude figures. They are not accurate, not even down to the million dollar item, and they may be off 3, 4, maybe 10 million dollars as some that were indicated yesterday, but I am quite sure that whatever figures I give we can reconcile those figures with any figures that have been used, submitted by the Department of Defense, because the data all comes from the same basic information.

Senator SYMINGTON. General, the Chair would like to make this observation. We are sure that you are giving us to the best of your ability the accurate answers to the questions. We have on the staff some able people with respect to figures. Many times in the past I have seen research and development and production and operating problems, fogged up by careless and slippery use of figures.

We do not intend to have that happen this time. I am making no criticism of anybody.

Therefore we will put people to work with you and your staff, and in any place you gave figures before they were final, in the record you can change, or add a note, an addendum of explanation, or any other way you would care to handle it.

The final figures will be your figures in the record as you set them, with any reasons why you believe them to be correct.

Is that satisfactory?

General PUTT. That will be quite satisfactory.

Senator SYMINGTON. Will you proceed, Mr. Counsel?

General PUTT. I only want to make sure we have the facts.

POLICY COUNCIL

Mr. HAMILTON. Is there a Chairman of this Policy Council, Research and Development Policy Council?

General PUTT. Yes, sir; Dr. Furnas acts as the Chairman of the Policy Council.

Mr. HAMILTON. He is the Chairman at the present time?

General PUTT. He is the Chairman at the present time.

Mr. HAMILTON. Who was his predecessor?

General PUTT. Mr. Quarles.

Mr. HAMILTON. Do you recall the period of time during which Mr. Quarles was chairman?

General PUTT. He was Chairman——

Mr. HAMILTON. If you do not recall I will withdraw the question.

Senator SYMINGTON. Was it over a period of years or a period of months?

General PUTT. Mr. Quarles?

He was there for several years—2 or 3.

Mr. HAMILTON. He was succeeded by Dr. Furnas?

General PUTT. He was succeeded by Dr. Furnas within the last year.

HOW CEILINGS ARE SET

Mr. HAMILTON. General, do you know the basis upon which the research and development ceiling as set forth in the guidelines is divided among the three services?

General PUTT. I don't really know how it is set.

Senator SALTONSTALL. Mr. Chairman, I could answer that question but I won't.

Senator SYMINGTON. Why not, I think it would be excellent if you did.

Senator SALTONSTALL. It is my understanding that the Assistant Secretary for Research and Development of Defense works out those figures and gives them to the three services, and while he has the overall authority to see that those are lived up to, the operation is left to the service. And he has the opportunity to so far as I know—now I am speaking a little vaguely—to change those if in his judgment he deems it to be necessary.

Senator SYMINGTON. May I say that he never could do it on his own authority.

If he has that authority, it is delegated to him by the Secretary of Defense.

Senator SALTONSTALL. That is correct, certainly.

Senator SYMINGTON. I am only speaking from the standpoint of organizational clarification.

Senator SALTONSTALL. Certainly that is true.

Senator SYMINGTON. The Secretary of Defense would either do that himself or delegate it to the Assistant Secretary of Defense.

Senator SALTONSTALL. That is, of course, correct.

Senator SYMINGTON. At this point in the record, Mr. Sprague, we would appreciate the research and development figure, the guidlines for the years 1955, 1956, and 1957 for the other two services as well as the Air Force. There is no use now of talking 1958.

Mr. SPRAGUE. Mr. Chairman, I believe those figures are in the record. They have been submitted by the Department of Defense.

Senator SYMINGTON. I thank you. Does it show the split between the services?

Mr. SPRAGUE. Yes, sir.

MISSILES CZAR

Mr. HAMILTON. General Putt, do you recall approximately when Mr. Murphree was appointed some months ago?

General PUTT. I believe it was within the last 2 or 3 months.

Mr. HAMILTON. I believe you mentioned in the course of your testimony that part of his job at least was to supplant the work that Deputy Secretary Robertson had been doing.

General PUTT. That is correct, upon his appointment he was made chairman of the OSD Ballistic Missile Committee.

Mr. HAMILTON. What changes in procedure, if any, were made subsequent to his appointment, changes to this procedure which you have described?

General PUTT. None that I know of.

Mr. HAMILTON. What changes, if any, were there made in the way in which the ICBM or IRBM programs operated following his appointment, if any?

General PUTT. The only change that I know of is that as chairman you would go talk to him instead of to Secretary Robertson.

Prior to the appointment of Mr. Murphree, the coordinating committee, the Guided Missiles Coordinating Committee——

Mr. HAMILTON. Of OSD?

General PUTT. Of OSD, still had some contact with the ballistic missiles program. Including all other missiles, all other guided missiles.

As soon as Mr. Murphree was appointed, he took over the Ballistic Missiles and the Coordinating Committee then had all of the missiles exclusive of ICBM.

Now I do not know just how much of a change this was.

Mr. HAMILTON. Then I am a little puzzled in light of the last answer as to whether from the standpoint of the efficiency of the operations, the speedup of the ICBM program and the IRBM program there was any change after the appointment of Mr. Murphree.

NO SIGNIFICANT CHANGE

General PUTT. I don't believe there has been any significant change. Up to now I would question whether there has been any significant change in the procedure.

As the machinery gets more experience, why of course it improves.

Mr. HAMILTON. I think that is all.

Senator SYMINGTON. Senator Saltonstall?

Senator SALTONSTALL. I haven't any questions.

Mr. HAMILTON. I have just one more, if I may.

You used the phrase basic planning budget in one of your answers, General.

Could you tell us what that is?

Senator SALTONSTALL. Would you repeat that, please?

Mr. HAMILTON. I just said, Senator, as I recalled it and as my notes indicate that the general used the phrase in response to one of my questions I think the phrase "basic planning budget" and I just wondered if he meant by "basic planning budget" any different type of budget than the one ordinarily talked about.

The answer, if this helps refresh your recollection, I rather got the impression which may be quite erroneous, that there was perhaps a long-term budget or a budget related to programs that was not the annual budget; with the ICBM there had been some sort of long-term projected budget that was different than the annual budgets.

But if you don't recall it maybe it will come to your mind when you read your testimony.

General PUTT. I do not recall it. The term itself is not significant to me. I do not recall using it.

### COST ESTIMATES FOR ICBM

Mr. HAMILTON. Have there been any estimates in that regard as to what the developments of the ICBM will cost, totally?

General PUTT. I am sure there have been some estimates but I have not seen the figures, estimates.

Mr. HAMILTON. Thank you, sir. That is all.

Senator SYMINGTON. I ask one more question and perhaps a supplementary question or two behind it.

### RESEARCH AND DEVELOPMENT FIGURES NOT AFFECTED

When General Twining submitted his budget of $20 million plus, it was cut to $18.8 million within the Air Force itself.

Was any of that cut in research and development, to the best of your memory, or that of your staff?

General PUTT. It was not.

Senator SYMINGTON. So the research and development figures stayed the same?

General PUTT. That is right.

Senator SYMINGTON. It was not cut until it reached the Secretary of Defense's office?

General PUTT. I think I am accurate in this.

The budget as submitted for 1957, the research and development portion of the Air Force budget, was submitted in accordance with the OSD guidelines.

I believe I am correct, and my advisers will correct me, we did not follow those guidelines to the extent of submitting a request for $18 million more than the guidelines specified.

In other words, $628 million instead of $610 million.

By the time the budget was reviewed in the OSD, the R. and D. request of the Air Force had been reduced to $610 million.

Senator SYMINGTON. So the amount of money you were told you could ask for by the Department of Defense was increased $18 million by the Air Force Secretary, prior to being submitted to the Department of Defense, but the Department of Defense said "No." Is that correct?

General PUTT. The figure given to us was really $610 million although it was stated as $431 million plus the indirect costs formerly in other appropriations. This accounting adjustment amounted to $179 million.

Senator SYMINGTON. And that was the figure they told you in the beginning you would be allowed to request?

General PUTT. That is correct.

Senator SYMINGTON. Thank you.

I have no further questions.

APPRECIATION

Mr. HAMILTON. Thank you very much, General Putt.

Senator SYMINGTON. Thank you, General, very much, and your staff as well as you, for your fine presentation, this splendid testimony, and the care and intelligence with which you have given it.

Off the record.

(Discussion off the record.)

COMMITTEE PROCEDURE

Senator SYMINGTON. Back on the record.

General Brentnall, you have discussed this with the counsel.

What would be the thought that you and the counsel had?

Mr. HAMILTON. My only thought was as many members of the committee as we could get would be interested in having a look at this because their names are so abstract and it is so difficult getting them in mind.

Senator SYMINGTON. Would you be good enough next week to come over when convenient to you?

General BRENTNALL. Yes, sir, whenever it is the desire of the chairman.

Senator SALTONSTALL. Mr. Chairman, if you have it, General, I would like to see all the guided missiles, is that your plan, not only the Air Force but the Navy and the Army?

General BRENTNALL. No, sir; just the Air Force.

I have no control over the Army and the Navy.

Senator SYMINGTON. We will recess until Tuesday at 10 o'clock.

(Whereupon, at 4 p. m., the committee was adjourned, to reconvene at 10 a. m., Tuesday, May 21, 1956.)

AFTERNOON SESSION

Present: Senators Symington, Jackson, and Duff.

Also present: Fowler Hamilton, general counsel.

Senator SYMINGTON. The subcommittee will come to order.

## TESTIMONY OF MAJ. GEN. SAMUEL R. BRENTNALL, ASSISTANT CHIEF OF STAFF FOR GUIDED MISSILES, UNITED STATES AIR FORCE, ACCOMPANIED BY BRIG. GEN. CHARLES M. McCORKLE, DEPUTY ASSISTANT CHIEF OF STAFF FOR GUIDED MISSILES; AND S. SGT. MAURICE LLOYD DOWNARD

Senator SYMINGTON. General Brentnall, I personally appreciate your coming here. In addition to my pleasure at again seeing a friend, I know all members of this subcommittee look forward to hearing what you have to say and show us. At this point I would like to insert in the record a résumé of your fine background and experience.

(The matter referred to is as follows:)

MAJ. GEN. SAMUEL R. BRENTNALL, UNITED STATES AIR FORCE

Samuel Robert Brentnall was born at Cleveland, Okla., on May 12, 1903. He was graduated from Phillips University in Oklahoma with a bachelor of arts degree in 1924. Entering the United States Military Academy that July, he was graduated on June 9, 1928, and commissioned a second lieutenant of field artillery in the Regular Army.

The following September General Brentnall entered Primary Flying School at Brooks Field, Tex. and was graduated from Advanced Flying School at Kelly Field, Tex., in October 1929. He was then assigned to the 95th Pursuit Squadron at Rockwell Field, Calif. On November 21, 1929, he transferred from the field artillery to the Air Corps. Assigned as a flying instructor at the Primary Flying School, March Field, Calif., in June 1931, the following October he transferred to Randolph Field, Tex., in the same capacity.

Going to the Panama Canal Zone in February 1935, General Brentnall was assigned to the 16th Pursuit Group and later served there with the 29th and 78th Pursuit Squadrons. On his return to the United States in October 1936 he became Air Corps representative at the Stearman Aircraft Factory, Wichita, Kans. The following July he entered the Air Corps Engineering School at Wright Field, Ohio, and was graduated in August 1938. A month later he began a mechanical engineering course at Leland Stanford University in California, from which he was graduated with a mechanical engineering-aeronautical degree.

Assigned to Wright Field, Ohio, in August 1939, General Brentnall served in the Experimental Section of the Materiel Division, and later was appointed Chief of the Production Engineering Section there. Transferring to Army Air Force Headquarters in Washington, D. C., in August 1943, he was named Chief of the Production Board in the Materiel Division. Going overseas in May 1945, General Brentnall joined the United States Strategic Air Forces in Europe, returning to Army Air Force Headquarters in July 1946.

Reassigned to Wright Field the following month, General Brentnall served with the Engineering Division and a year later was designated Assistant Deputy Commanding General for Research and Development there. In October 1947 he was named Chief of the Industrial Mobilization Planning Division there, the following month became Deputy Director of Research and Development, and in October 1949 was appointed Director of Research and Development. A year later General Brentnall was appointed Special Assistant to the Chief of Staff, United States Air Force, for the B–47 program, with station at Wright-Patterson Air Force Base, and the following February was designated director of production and service engineering there.

Transferring to Far East Air Forces on July 20, 1951, General Brentnall was named special assistant to the commanding general; that August was appointed assistant vice commander of Far East Air Forces, and a month later was designated vice commander.

Moving to Washington, D. C., on August 24, 1953, General Brentnall served with the Office of the Secretary of Defense as Assistant for Production, Office of Guided Missiles. A month later he was designated Assistant Deputy Chief of Staff, Operations, for Guided Missles at Air Force Headquarters, and on April 8, 1954, was named Assistant Chief of Staff for Guided Missiles.

His decorations include the Distinguished Service Medal, Legion of Merit with one Oak Leaf Cluster, and the Bronze Star. He received an honorary doctor of science degree from Phillips University, Oklahoma, in May 1955. He is rated a command pilot.

General and Mrs. Brentnall have one son, Burden.

PROMOTIONS

He was promoted to first lieutenant on March 1, 1934; to captain (temporary) on March 15, 1935; to captain (permanent) on June 9, 1938; to major (temporary) on February 1, 1941; to lieutenant colonel (temporary) on January 5, 1952; to colonel (temporary) on March 1, 1942; to major (permanent) on June 9, 1945; to brigadier general (temporary) on February 27, 1947; to colonel (permanent) on April 2, 1948; to major general (temporary) on September 13, 1949; to brigadier general (permanent) on January 27, 1950; to major general (permanent) on October 27, 1954.

Senator SYMINGTON. I think you have been sworn, haven't you?

General BRENTNALL. Yes, sir.

Senator SYMINGTON. Will you consider yourself as sworn?

General BRENTNALL. Yes, sir.

Senator SYMINGTON. And you, General?

General MCCORKLE. I am General McCorkle.

Senator SYMINGTON. And you have been sworn, too, General?

General MCCORKLE. Yes, sir.

Senator SYMINGTON. Consider yourself as sworn.

Mr. Counsel, can you carry the hearings over for a day?

Mr. HAMILTON. I think so.

Senator SYMINGTON. Proceed.

General BRENTNALL. We were asked by counsel, sir, to show you what other missiles we had in the Air Force stable and their development, other than the ICBM and IRBM which we discussed last week.

FALCON

This first missile I want to show you [indicating slide] is the Falcon. It is a very small missile. (D)

It is made small so that we can tuck it inside the aircraft. At the beginning of the development of an air missile of this type, the Navy and ourselves distinguished the need that we would have for an air missile. (D)

TALOS

This [indicating on slide] is the Talos missile, which the Navy has developed for us. (D)

This is in development by the Navy for us—and I don't remember when we can get the first ones. We can supply that. (D)

Mr. HAMILTON. Did you mention where you should be with reference to production by units?

General BRENTNALL. No, I did not, when the first operational unit—we have it here, sir; we can supply it. (D)

BOMARC

The next missile that we have in the stable is the Bomarc, built by Boeing. Many people have asked where the name comes from. I believe it is a combination of the University of Michigan and Boeing,

a study going on there for several years, and I am told that it is Boeing-Michigan Air Research Contract, if that means, anything.

This is a very long-range surface-air missile. (D)

MATADOR

This slide [indicating] is the Matador, which is a surface-to-surface missile. (D)

We have two squadrons in Germany and a third one being deployed in June. (D)

This is now actually in production and there are two squadrons of them in Germany.

Are there any questions?

Here is the Rascal, your air-to-surface missile. It is schematically depicted here——

Senator SYMINGTON. Excuse me.

On the Matador that weapon is pretty rapidly becoming obsolescent; isn't it?

General BRENTNALL. Obsolescing—yes, sir. It still has a very good tactical use. (D)

It looks like a mean weapon, particularly in bad weather, where you can get it out of radar detection, because its radar silhouette is very small, it stays on the deck, and it would be awfully mean to bring in with an atomic warhead; you wouldn't know it was there, and even though it is subsonic, it will do a lot of good for a good length of time.

Senator SYMINGTON. What missile can take its place? What is planned to take its place?

General BRENTNALL. We have nothing in the book to take its place.

Senator SYMINGTON. The Navaho?

General BRENTNALL. Well, it is too long range.

Senator SYMINGTON. Yes.

General BRENTNALL. You possibly can use Snark.

RASCAL

Now the Rascal is an air-surface weapon. (D)

The way it works is this: You bring it within the range to go to the target, you fire it, you launch it, and the mother ship then pulls away. (D)

This is very accurate. (D)

SNARK

This missile [indicating slide] is the first of the strategic missiles, first also meaning we have worked on it considerably, and also that it will be in the inventory first. (D)

It is the Snark, it is an air-breathing missile, it is subsonic. It is a simple, straightforward pilotless aircraft. (D)

It is the one that was released to the papers not long ago, and it flew approximately 2,000 miles. (D)

NAVAHO

This slide [indicating] is the Navaho. This missile is another approach. It is built by North American. (D)

It will do other things, if we get into position to have to use it; besides not risking a crew, you have no problem of having to get your mother airplane away from such a big thing. Ⓓ

Senator JACKSON. Have you covered air-to-ground?

General BRENTNALL. Yes sir; the Rascal.

Senator JACKSON. You have covered that?

General BRENTNALL. Yes, sir. Ⓓ

ICBM

Now, I have some cutaways on the ICBM, if you would like to have some more information on that—or have you talked enough about it the other day?

Mr. HAMILTON. If you have pictures of the cutaway or——

General BRENTNALL. No, a slide.

Mr. HAMILTON. We might be interested in seeing what the ICBM looks like.

General BRENTNALL. Yes, sir.

This [indicating slide] is a black and white and it looks a little anti-climactic after all the others. Ⓓ

Senator SYMINGTON. Any further questions?

Senator DUFF. No, sir.

Senator SYMINGTON. Thank you very much, General.

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